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Enhancing social science learning with augmented reality for primary students in a CLIL context

Melhorar a aprendizagem das ciências sociais com realidade aumentada para estudantes do ensino fundamental em um contexto CLIL

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ABSTRACT
Learning content through a second language is a challenging task for both students and teachers. Previous research has shown that information and communication technologies (ICT) such as Augmented Reality (AR) can facilitate content learning. This study aims to evaluate the effectiveness of using Augmented Reality (AR) technology in teaching Social Science in a Content and Language Integrated Learning (CLIL) context for primary education students. The study was conducted with sixth-year primary students in a state-subsidized school in Bizkaia, Spain. Several sessions using AR to work on content about economic sectors have been implemented. Additionally, some questionnaires based on previous experiences have been designed to gather data on students' current use of technology along with students' and teachers' opinions on using AR as a teaching tool after the sessions. Results showed a positive impact on student learning outcomes since after the brief AR intervention students improved significantly in most of the activities and, particularly, in vocabulary-related and content comprehension activities. Both students and teachers expressed favourable opinions towards using AR in the classroom.

Keywords: augmented reality, CLIL, social science, primary education, educational technology.

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RESUMO

Aprender conteúdo através de uma segunda língua é uma tarefa desafiadora tanto para alunos quanto para professores. Pesquisas anteriores mostraram que as tecnologias de informação e comunicação (TIC) como a Realidade Aumentada (RA) podem facilitar a aprendizagem do conteúdo. Este estudo visa avaliar a eficácia do uso da tecnologia de Realidade Aumentada (RA) no ensino de Ciências Sociais em um contexto de Aprendizagem Integrada de Conteúdo e Linguagem (CLIL) para estudantes do ensino fundamental. O estudo foi realizado com estudantes do sexto ano do ensino fundamental em uma escola subsidiada pelo Estado em Bizkaia, Espanha. Várias sessões utilizando o AR para trabalhar o conteúdo sobre setores econômicos foram implementadas. Além disso, alguns questionários baseados em experiências anteriores foram elaborados para reunir dados sobre o uso atual da tecnologia por parte dos estudantes, juntamente com as opiniões dos estudantes e professores sobre o uso do RA como ferramenta de ensino após as sessões. Os resultados mostraram um impacto positivo nos resultados do aprendizado dos estudantes, uma vez que após a breve intervenção de RA os estudantes melhoraram significativamente na maioria das atividades e, particularmente, nas atividades relacionadas ao vocabulário e à compreensão de conteúdo. Tanto estudantes quanto professores expressaram opiniões favoráveis ao uso de RA na sala de aula.

Palavras-chave: realidade aumentada, CLIL, ciências sociais, educação primária, tecnologia educacional.

1 INTRODUCTION

Learning subjects in a foreign language can be challenging for students. As an example, subjects such as Social Science require students to understand a large number of new concepts, structures and vocabulary and, consequently, students´ success will partially depend on their knowledge of vocabulary and linguistic structures. Accordingly, teachers of subjects taught in a foreign language are constantly faced with the need to find ways of helping students to understand the content presented in a language that they are still learning (Weisman & Hansen, 2007). CLIL is an acronym for Content and Language Integrated Learning. According to Marsh (2002, as cited in Coyle, 2007), CLIL includes any activity in which a foreign language is used as a tool in the learning and teaching of both content and language. Lyster and Ballinger (2011) provide a more recent definition: “CLIL is an instructional approach in which non-linguistic

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curricular content such as geography or science is taught to students through the medium of a language that they are currently learning as an additional language" (p. 279). This dual educational approach does not focus on one of them, as they are interrelated (Coyle, Hood & Marsh 2010: 1).

Information and communication technologies (ICT) offer interesting possibilities to foster the learning of both content and language. Accordingly, the educational curriculum acknowledges the role of new technologies as a key resource for learning, and digital competencies are considered one of the basic skills to be developed (Aguirregoitia et al., 2017).

Augmented Reality (AR) technology blends the real world and virtual images and ensures real-time interaction, which has been proved to be effective and attractive for students (Azuma, 1997). Recently, Cabero and Barroso (2016) conducted an analysis of the published works on AR, in which the following benefits of this technology in educational contexts are highlighted: it facilitates the understanding of complex concepts (Joo-Nagata et al., 2017; Laine et al., 2016; Merzlykin et al., 2018); favours the contextualisation of information; allows individualisation and adaptation to different types of intelligence; offers students the possibility to interact by manipulating real objects; favours ubiquitous learning; facilitates the development of a constructivist teaching/learning methodology; favours the development of graphic competences through the perception of spatial content and 3D objects; favours learning by doing (experiential learning); increases motivation (Hung et al., 2017; Merzlykin et al., 2018; Tobar-Muñoz et al., 2017); improves academic results (Wei et al., 2015) and satisfaction (Hsiao et al., 2016; Huang et al., 2016); is flexible, as it can be used at different educational levels and in different disciplines and it can be combined with other teaching methodologies.

In the Spanish context, many studies have already been conducted. As an example, Toledo-Morales and Sánchez-García (2018) carried out a study with 10–11-year-old 49 5th-grade students in Seville. Using a longitudinal design (the study was carried out in one whole academic year), the authors had an experimental group, which used AR tools, and a control group, which followed

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traditional teaching methods. This study aimed to analyse whether the use of AR influenced knowledge acquisition and learning, compare students' grades before and after the use of AR, and explore students' perceptions of AR. To do so, the following procedure was used: (i) a pre-test phase (prior knowledge), (ii) a learning phase (the session of the selected topic, which was explained traditionally to the control group and using AR with the experimental group), (iii) post-test phase (assessment of knowledge in both groups), (iv) perception on the use of AR and (v) interview phase with AR students and teachers. The topic "The Representation of the Earth" was chosen in collaboration with the teachers because it was part of the syllabus of the subject and ad-hoc content was created using the AR software *Aumentaty Author*. In the classroom, these contents were visualised by pairs of students using 15 tablets. The results showed that after the use of AR, the experimental group performed better. As for the students' perceptions, they considered that the use of AR facilitated their learning and understanding of the content and that the sessions were less boring and more interesting. However, there is still a dearth of studies that adequately present and analyse the educational potential and possibilities of AR technology in Primary Education (Fotaris et al., 2017).

Considering the previous experiences, this study aims at finding new evidence of the effectiveness of AR in a Content and Language Integrated Learning (CLIL) context to learn Social Science content. To define the context, students' use of the technologies and their views on the use of AR as a teaching tool as well as teachers' views on the use of the technologies will also be analysed. For this purpose, four intervention sessions have been designed along with both pre- and post-tests on students' understanding of content and perception of technology. Lastly, results were quantitatively and qualitatively analyzed.

The next sections are structured as follows: firstly, the methodology followed will be described along with the sample characteristics; then, the instruments for data collection and the procedure of the study will be described and, finally, the results and the main conclusions of the work will be presented.

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2 METHODOLOGY

2.1 CHARACTERISTICS OF THE SAMPLE

The didactic unit was implemented in a multilingual charter school located in Bizkaia, in the Basque Autonomous Community, more specifically, in one of the sixth-grade classrooms. In this school, two linguistic models coexist: A and B models. The A model offers some subjects in English through the CLIL methodology. In other words, students learn the target language (English) integrated into subjects such as Social Sciences. At the socio-cultural level, the school does not show great diversity, as most of the students are from a close area. Regarding the socio-economic level, it could be said that the children's families belong to a medium-high socioeconomic status. Concerning language, it is Spanish that is mainly used as a means of communication. English is mainly reinforced at school through exchange programmes with other countries and preparation for official Cambridge exams from the sixth year of Primary Education onwards. Basque, on the other hand, is only taught as a subject.

The classroom selected for the research had 24 pupils, 14 girls and 10 boys. Although some students were 12 years old, most were still 11 years old when the intervention took place. Concerning English, they had a high proficiency level for their age (A2) and great motivation towards learning the language.

2.2 INSTRUMENTS FOR DATA COLLECTION

This section describes the steps followed along with the instruments used:

- First of all, the study required an agreement with a school using the CLIL methodology.
- The next step was to define the topic that the didactic unit will cover : "Economic sectors". This topic is part of the syllabus for the sixth grade of Primary Education and was also appropriate for the use of AR. The contents of the unit were selected based on the minimum that the students should acquire after the sessions. The key vocabulary as well as the grammar to be covered - the present simple and the generic, definite and indefinite articles –was defined.

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- Later, it was necessary to design the activities of the didactic including their objectives, level and resources needed for each one of them (images, videos,…). After the design, they were incorporated into the Augmented Class application. For each activity, 1, 2, 3 or 4 markers - cards containing images and text - had to be added (*see Figure 1.1 in Appendix 1*). Once the markers had been created, the audio, video, image or 3D objects were added (*see Figure 1.2 in Appendix 2.2*) according to the requirements of the activity. Each set of markers, when scanned, would provide relevant information to learn the content and, additionally, interaction among markers was also integrated. As an example, when the markers are not together scanning each of them results in an explanation of the concept, and, besides, when they are correctly matched together audio feedback congratulating the students for the successful completion of the matching activity will be provided.
- Next, we prepared the questionnaire on technology to be administered to teachers and the pre- and post-tests for students. The items in the teachers' questionnaire were adapted from Abrami and Sclater (2006). On the one hand, the students' pre-tests covered both technology and content. The items in the pre-test on technology were adapted from Sato et al. (2020). The technology test contained statements about the type and frequency of use of different technologies: computer, tablet, smartphone and, if known, AR. For each statement, students had 4 options: Definitely no (D No), No, Yes and Definitely yes (D Yes). The content test included different activities related to the three economic sectors to assess their knowledge before the sessions. On the other hand, the post-tests were designed to assess the learning outcomes and their perception on the use of AR after the experience. The items in the post-test on technology were adapted from Harfield (2014). The first one contained statements about the AR experience, to which they could respond with four different answers: Definitely No (D No), No, Yes and

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Definitely yes (D Yes). The content test was identical to the pre-test, to assess students' learning outcomes after the sessions.

- Later, the didactic unit using AR was carried out. The material was used in four sessions of approximately half an hour each. Before starting the sessions, a brief explanation to the whole group about the use of AR was provided: what markers are, how to use them in the activities and how to solve the activities through the AR application. As for the sessions, the class was divided into two groups and the AR sessions were carried out with half of the group in a different classroom for effective performance. The activities and their objectives were previously planned and the materials and the markers required were carefully arranged before the sessions, which took most of the time.
- Finally, post-tests were administered to teachers and students to assess the learning process and to know their perceptions of the use of AR in the classroom.

2.3 PROCEDURE

On the first day at the school, the students took the two pre-tests, the technology and the content test. Once they finished, the class was divided into two groups: A team and B team trying not to separate the students from the cooperative groups already established in the classroom. Once divided A team went to a different classroom. Later, they were asked if they knew what AR was, and, in general, they had not heard of it. Therefore, one of the researchers explained what it was and introduced them the application and the basic concepts they should know to use it. In order to do so, a *Canva* presentation was prepared. Afterwards, the same procedure was followed with B team.

The next day at school the pairs and trios were arranged before distributing the tablets. A team went first, and one of the researchers explained the first activity of the first session. As there were different rhythms, each group needed a different amount of time to complete the activity. Therefore, in an attempt to respect their rhythms, they were advised to draw the researcher's attention once

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they have finished one activity to receive instructions for the next activity. In addition, while they were completing the activities, the researcher walked around the groups to check and offer support. Finally, the activities of the first and second sessions were completed. The same procedure was used with the B team.

The following day, again, A team was the first one. First of all, the third session was conducted as a group. In this way, each of the students felt involved, the contents were understood and the doubts were solved. Once this session was completed, the fourth and last session was carried out, in which the students had to create their projects with the tablet. Once finished, the B team proceeded identically.

Finally, one day later, the students carried out the two post-tests, the test on AR and the test on the content.

4 RESULTS

This section analyses the results obtained both quantitatively and qualitatively.

4.1 TEACHERS' PERCEPTIONS ABOUT THE USE OF TECHNOLOGY IN THE CLASSROOM

The five teachers involved completed a questionnaire on the use of technology in the classroom. The participants were four women and one man, with different years of experience, most of whom favour a methodology where there is a fair balance between teacher-centred and learner-centred activities.

The results show that all the teachers consider technology to be a valuable instructional tool that increases academic performance and promotes pupil collaboration. They all consider the use of technology to be effective and they believe they can use it effectively while 80% of the teachers say that the use of educational technology makes them feel more competent as educators and that it enhances their professional development and allows them to be facilitators of learning rather than providers of information. Nonetheless, two of the teachers do not share the view that the use of AR promotes the development of

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communication skills. However, they admit that it can be successful if adequate teacher training is provided on how to use it for learning.

Concerning students, they consider that it is an effective tool for students of all abilities, that it helps to accommodate their personal learning styles, that it motivates them to become more involved in learning activities and that it promotes the development of interpersonal skills. Finally, only one teacher considers that the use of technology might increase the amount of stress and anxiety experienced by students and make classroom management more difficult. The most controversial question seems to be if they believe that technology improves student learning of critical concepts and ideas, which is something 60% of the teachers agree with. Conversely, 40% of the teachers are more cautious in this aspect.

4.2 STUDENTS' USE OF TECHNOLOGY

Before the sessions, students completed a questionnaire on their use of technology, namely computer, tablet, smartphone and AR.

The pre-test about technology consisted of 24 questions about students' use of different technologies, which were divided into four blocks: Computer, tablet, smartphones and AR. This test shows that in general students use all the technologies mentioned for different purposes. However, they were not familiar with AR. Regarding the first block (*Computer*), the results show that students do not use the computer every day, as they use the tablet (which I will discuss below), and, when they do, it is for educational purposes or to browse the Internet and to watch videos. As for the second block (*Tablet*), the results show that except for 8% of the class, the rest uses the tablet. They use it for education - they work with it at school- and also for playing games, browsing the Internet and watching videos. The third block (*Smartphones*) deals with the use of smartphones. In this case, the results show that most of the students use them, in general, to contact friends and to browse the Internet. The fourth and last block (*AR*) aimed to find out if the students knew about AR and or if they had previously used any AR application. Hardly any of the students knew what AR was.

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4.3 LEARNING OUTCOMES

Figure 1 illustrates the difference between pre- and post-tests means for each of the activities that the students completed (*see Appendix 1* for details).

Figure 1 Difference between the post- and pre- tests results

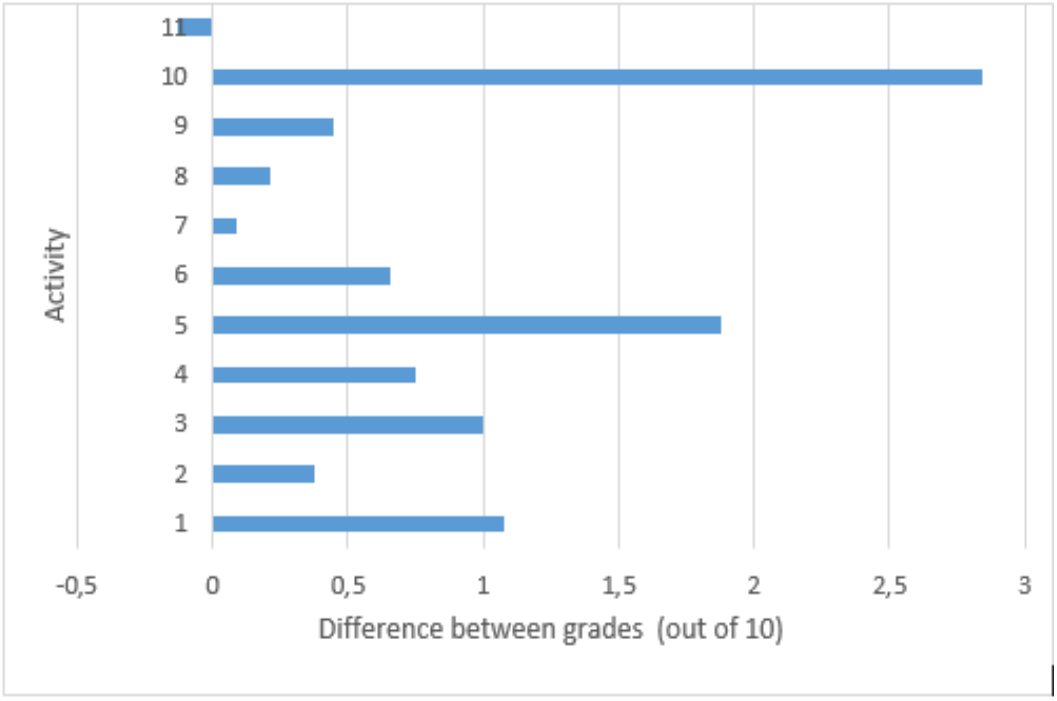

Table 1 (*see Appendix 1*) provides the sample means and standard deviations for each of the items in the pre- and post-tests on content, as well as the maximum and minimum scores obtained by the students in each item. In some activities, namely Activity 3 (mean 3.33/4), Activity 7 (mean 2.83/3), Activity 8 (mean 3.67/4) and Activity 11 (mean 3.63/4), the means were high already in the pre-test, indicating that those were perhaps easy items from the beginning. In the rest of the pre-test activities, the means were not too high, that is, the items, before the sessions, were not as easy for them, especially in activities 5 (mean 4.25/8) and 10 (mean 2.79/6).

Table 2 (*see Appendix 3*) provides a comparison of the mean pre- and post-scores for each of the activities where. Except for Activity 11 where mean post-scores were slightly lower than the mean pre-scores, mean post-scores were consistently higher than the mean pre-scores for each activity. In order to

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test for statistical significance between pre- and post- tests on content scores, a paired t-test for dependent samples was used (Hogg & Tanis, 1988).

In addition, robust alternatives based on the Wilcoxon's signed rank test (Conover, 1980; Hogg & Tanis, 1988) reached the same conclusions. The Wilcoxon signed-rank test is a nonparametric robust alternative to the paired t-tests above and the resulting p-values for each of the tests. Table 2 (*see Appendix 3*) includes the mean differences, standard deviations, 95% confidence intervals, test statistic values for the paired t-tests, degrees of freedom for the student's t-distribution, and resulting p-values for each of the tests. The null hypothesis being tested was that there was no difference between the mean post- and the mean pre-scores, against the alternative hypothesis that the mean post-scores were higher than the mean pre-scores. At the 5% significance level, differences were not statistically significant (that is, the confidence interval included the value zero or the p-value was larger than the established significance level, 0.05) for activities 7, 8 and 11 (something I will discuss in more detail later in this section). Moreover, for activity 11, the mean pre-scores were slightly higher than the mean post-scores. For the remaining activities (that is, activities 1, 2, 3, 4, 5, 6, 9 and 10), we can conclude that mean post-scores were statistically higher than mean pre-scores (that is, the confidence interval did not include the value zero and both the lower and upper values were positive or the p-value was smaller than the established significance level, 0.05). That is, in 8 out of 11 questions results were significantly better only with four sessions.

Activities where the test statistic value (that is, *t*) is higher than 2 show a relevant improvement. In the activities mentioned above (Activities 1, 2, 5, 6 and 10) *t* is higher than 3, which indicates that the improvement is remarkable. To interpret the results using confidence intervals - with a 95% of confidence - mean post-scores for activity 1 are between 0.602 and 1.564 points higher than the mean pre-scores. Similarly, mean post-scores for activities 2, 5, 6 and 10 are higher than the mean pre-scores.

Significant improvements have been observed both in activities that were focused on vocabulary and in content comprehension. Exercises 1 and 6 were

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focused on vocabulary and content comprehension as learners had to identify the activities belonging to the sector in question and to identify the words. Exercise 5 also involved both content and vocabulary knowledge, that is, students had to know the vocabulary related to the topic to correctly classify the different raw and manufactured materials in their respective economic activities. Exercise 2 was a comprehension activity, involving both content and grammar. Finally, Exercise 10 involved reflecting on the content received and being able to place different images in order, as well as identifying which sector each one belonged to. The great improvement in these five exercises also reflects the improvement in content knowledge, vocabulary and understanding of grammar after the various sessions carried out.

However, it is also important to reflect on what has been previously observed in other activities, namely exercises 3, 7, 8 and 11, which showed good results already at the beginning. Therefore, in some of them, slight or no improvement from pre-test to post-test was observed. Exercise 3 consisted in writing the name of the economic activity to which the definition corresponded. In this case, some were very simple and others could be found in the first activity, in which the names of several primary sector activities were written. Exercise 7 consisted in matching the economic activities with their description. This could be guessed from knowing some of the words in the definition. Exercise 8 students had to link the raw material with the manufactured material, so it did not require the use of language. Finally, Exercise 11 consisted in writing the number of the sector to which each activity in the different pictures belonged. In this case, we can only speculate that they did not read or understand the instructions well. In general, instead of writing the number of the sector to which the activity in the picture belonged, they put the pictures in "order". So, by pure chance, the results in the pre-test were higher than the results in the post-test.

4.4 STUDENTS' PERCEPTIONS ABOUT THE USE OF AR

The post-test on technology consisted of different questions related to AR, taking into account different factors: Engagement, attention and interest (Block

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1), Usability (Block 2), Emotional attachment (Block 3), Focus of attention (Block 4) and Presence (Block 5). This post-test was aimed at evaluating the students' experience with AR, as it was something new for them. Overall, the results of this post-test were very positive. 78% of the students claimed that they were excited about the experience and that they liked the feeling of being part of the activity. However, the students said that they did not feel they were the protagonist of the activity, perhaps because the topic has not been chosen by them or was not interesting to them.

As for the first block, the AR application that was used caught their attention, the topic of the activity made them want to know more about it, they liked the design and appearance of the AR application and they wanted to spend time completing the activity successfully while the vast majority (88.5 %) did not consider participating in the activities as a waste of their time. As for the second block, they found the application easy to use (95.8 %), felt confident using it and felt that they could use it to search for the information they needed (79%). Regarding the third block, the results show that students were impatient in terms of completing the activities successfully (70%) and that they were excited to feel part of the activities and responsible for them. As for the focus of attention, addressed in the fourth block, the results show that if students were interrupted, they looked forward to returning to the activity and they manifest to be more focused on the activity than on any external distraction. Moreover, they felt that time passed quickly during the sessions (88%).

In addition, students were allowed to express their opinion in writing at the end of the test. Figure 2 shows some of the comments made by the students.

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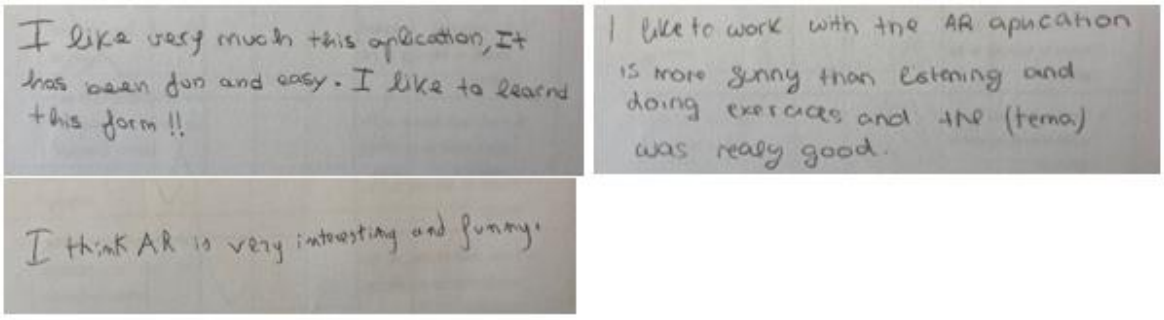
Figure 2 Comments made by students



5 CONCLUSIONS

The main objective of this work was to analyse the possibilities of AR to teach Social Science in English in a Primary Education classroom and to evaluate its impact on the comprehension of the content and the learning of vocabulary and grammar. The most relevant conclusions of this research are that in most activities students performed better in the post-test than in the pre-test and, therefore, we could claim that even a brief intervention of four sessions has had a positive impact on their knowledge and attitude. On the other hand, we also analysed the use of technology by students and their opinion on AR after carrying out the sessions. The application has been positively evaluated: it caught their attention, it was easy to use, they felt excited to be part of the activities and considered that time passed by quickly during the sessions. Moreover, teachers' views on new technologies in the classroom are important for a successful experience. In this case, teachers stated that the use of technology in the classroom can be of real benefit both for them and their students but it must be properly planned and resourced.

This study also had shortcomings that should be acknowledged. It was a single lesson carried out in a few sessions and with only one group of students. Moreover, as mentioned above, some unexpected technical and organisational issues had to be solved so that students could hear and watch properly in the classroom without interference. For further research, more focused attention on personalization may be interesting, which could be obtained by designing tailor-made post-tests taking into account both the students' prior content knowledge

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and level of English. This would result in more effective and meaningful learning for students. All in all, the results should be interpreted with caution because the scope is narrow, but the outlook is indeed positive, as students have not only used the application but they have also had the opportunity to create their own content with it.

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APPENDICES

Figure 1.1

Markers (For additional information see https://youtu.be/TdjDS_CURp0)

1 marker: In this case, students had to bring the tablet close to the different markers to discover more information about each of them.

Note. From Mapa administrativo del país vasco [Photograph], by Lesniewski, R., n.d.

Note. From Patatas de Ávila: originarias de Álava [Food Photograph].

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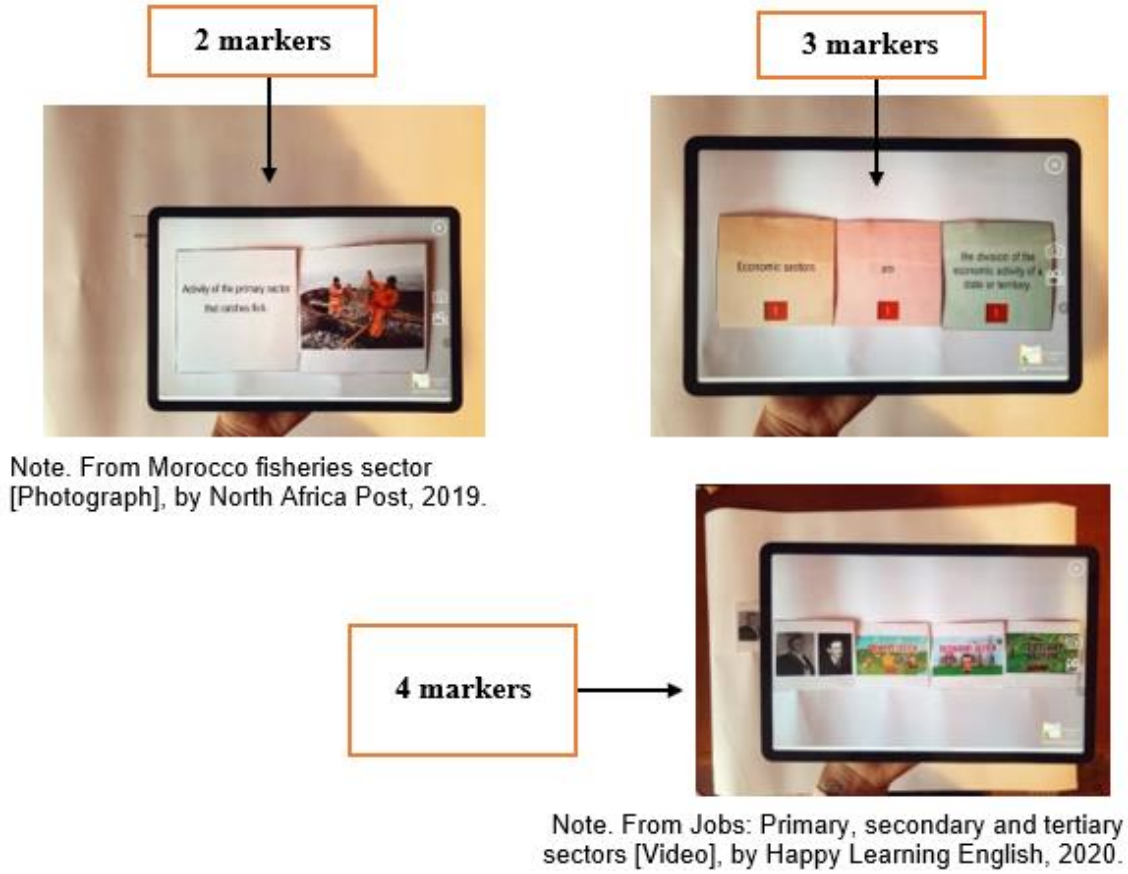

Note. From Morocco fisheries sector [Photograph], by North Africa Post, 2019.

Note. From Jobs: Primary, secondary and tertiary sectors [Video], by Happy Learning English, 2020.

Figure 1.2

Examples of markers with audio, video, image or 3D object

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3D object

Note. From TECLAST Portátil [Computer Photograph].

Note. From Transport. [Vehicles Photograph].

Applying AR

Applying AR

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Appendix 2. Statistics of the learning results

Table 1 Paired Samples Statistics for the pre- and post-tests on content Note: (N=24)

	ACTIVITY	Mean	Std. Dev.	Std. Error Mean			Mean	Std. Dev.	Std. Error Mean
Pair 1	Post Activity 1 (4)	3.50	0.659	0.135	Pair 7	PostActivity 7 (3)	2.92	0.408	0.083
	Activity 1 (4)	2.42	1.139	0.232		Activity 7 (3)	2.83	0.565	0.115
Pair 2	PostActivity 2 (1)	0.96	0.204	0.042	Pair 8	PostActivity 8 (4)	3.88	0.612	0.125
	Activity 2 (1)	0.58	0.504	0.103		Activity 8 (4)	3.67	1.129	0.231
Pair 3	PostActivity 3 (5)	4.33	1.049	0.214	Pair 9	PostActivity 9 (4)	3.33	0.963	0.197
	Activity 3 (5)	3.33	1.523	0.311		Activity 9 (4)	2.88	0.797	0.163
Pair 4	PostActivity 4 (4)	3.71	0.550	0.112	Pair 10	PostActivity 10 (6)	5.63	1.013	0.207
	Activity 4 (4)	2.96	1.233	0.252		Activity 10 (6)	2.79	1.911	0.390
Pair 5	PostActivity 5 (8)	6.13	2.383	0.486	Pair 11	PostActivity 11 (4)	3.50	1.022	0.209
	Activity 5 (8)	4.25	2.770	0.565		Activity 11 (4)	3.63	0.924	0.189
Pair 6	PostActivity 6 (3)	2.79	0.509	0.104					
	Activity 6 (3)	2.13	0.947	0.193					

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Appendix 3

Table 2 Paired Samples Tests for the pre- and post-tests on content

Paired Samples Test									
		Paired Differences					t	df	p-value
		Mean	Std. Deviation	Std. Error Mean	95% Conf Int Lower	95% Conf Int Upper			
Pair 1	PostActivity 1 (4) - Activity 1 (4)	1.083	1.139	0.232	0.602	1.564	4.660	23	<0.0001
Pair 2	PostActivity 2 (1) - Activity 2 (1)	0.375	0.576	0.118	0.132	0.618	3.191	23	0.002
Pair 3	PostActivity 3 (5) - Activity 3 (5)	1.000	1.818	0.371	0.232	1.768	2.695	23	0.006
Pair 4	PostActivity 4 (4) - Activity 4 (4)	0.750	1.260	0.257	0.218	1.282	2.917	23	0.004
Pair 5	PostActivity 5 (8) - Activity 5 (8)	1.875	2.849	0.581	0.672	3.078	3.225	23	0.002
Pair 6	PostActivity 6 (3) - Activity 6 (3)	0.667	.868	0.177	0.300	1.033	3.762	23	0.001
Pair 7	PostActivity 7 (3) - Activity 7 (3)	0.083	.408	0.083	-0.089	0.256	1.000	23	0.164
Pair 8	PostActivity 8 (4) - Activity 8 (4)	0.208	1.318	0.269	-0.348	0.765	0.774	23	0.223
Pair 9	PostActivity 9 (4) - Activity 9 (4)	0.458	1.250	0.255	-0.070	0.986	1.796	23	0.043
Pair 10	PostActivity 10 (6) - Activity 10 (6)	2.833	1.880	0.384	2.039	3.627	7.381	23	<0.0001
Pair 11	PostActivity 11 (4) - Activity 11 (4)	-0.125	.992	0.202	-0.544	0.294	-0.617	23	0.728