

Language teachers' perceptions on the use of OER language processing technologies in MALL

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ABSTRACT

Combined with the ubiquity and constant connectivity of mobile devices, and with innovative approaches such as Data-Driven Learning (DDL), Natural Language Processing Technologies (NLPTs) as Open Educational Resources (OERs) could become a powerful tool for language learning as they promote individual and personalized learning. Using a questionnaire that was answered by language teachers ($n = 230$) in Spain and the UK, this research explores the extent to which OER NLPTs are currently known and used in adult foreign language learning. Our results suggest that teachers' familiarity and use of OER NLPTs are very low. Although online dictionaries, collocation dictionaries and spell checkers are widely known, NLPTs appear to be generally underused in foreign language teaching. It was found that teachers prefer computer-based environments over mobile devices such as smartphones and tablets and that teachers' qualification determines their familiarity with a wider range of OER NLPTs. This research offers insight into future applications of Language Processing Technologies as OERs in language learning.

KEYWORDS

Language learning; teachers' perceptions; OER; MALL; natural language processing technologies; higher education

1. Introduction

Mobile devices have become essential for billions of people around the world. The sales and use of mobile devices such as smartphones and tablets have been increasing every year since the beginning of the twenty-first century (Chen & Denoyelles, 2013; Chen, Yen, & Chen, 2009), allowing smartphone users both personal satisfaction and social influence (Shin, Shin, Choo, & Beom, 2011). In 2013, there were more mobile devices than laptops and desktop computers, and smartphones sales surpassed those of regular phones. This popularity and spread can be better understood when one looks at usability factors such as interface simplicity and interactivity (Lee, Moon, Kim, & Yi, 2015). Mobile

devices, and in particular smartphones and tablets, have been extremely successful in providing users with 24/7 Internet connectivity and convenience of use (Naismith, 2004), ubiquity (Shin et al., 2011) and a wide variety of multimedia contents, among which there can be found affordable, very often free, quality learning contents (Page, 2014), and, more specifically, language learning materials in the form of Open Educational Resources (OERs).

Thomas and Evans (2014) highlighted the relevance of OERs for language learning and teaching in the context of Web 2.0 services and, among others, user generated content and student production. However, this huge potential remains largely unexplored. Steel (2016) found that Australian university students use mobile devices for speaking, listening, reading, writing, grammar, pronunciation and, lastly, for the learning of language cultural aspects. However, Natural Language Processing Technologies (NLPT) as potential resources for language learning have not been implemented in this same way. Despite the impact of NLPTs, corpora and data-driven learning on language education, no mention was made in Steel (2016) to the use of user-generated resources for the acquisition of languages. Other studies like Chujo and Oghighian (2012), Geluso (2013) or Karras (2016) seem to ignore this potential.

This article explores the role of Mobile Assisted Language Learning (MALL) and teachers' perceptions of Natural Language Processing Technologies (NLPT) as Open Educational Resources (OERs). In particular, it will be discussed how language-related OERs are perceived by the language teaching community in the UK and Spain in terms of knowledge as well as use. Following a definition of OERs as digital resources that can be repurposed for teaching and learning (Thomas & Evans, 2014), it will be argued that language processing technologies delivered through web services or apps should be considered as valuable OERs in language learning and teaching as they offer the potential to favour active pedagogic approaches, language awareness raising and personalization of the learning experience.

2. MALL, DDL and language processing technologies as open educational resources in second language education

Mobile Assisted Language Learning (MALL) takes advantage of the main affordances of mobile devices: ubiquitous learning without the need of a physical permanent cable connection, the ability to exchange information seamlessly with other users and devices, and the availability of educational materials and constant connection between student and teacher (Georgiev, Georgieva, & Smrikarov, 2004; Kukulska-Hulme, Traxler, & Pettit, 2007; Kukulska-Hulme, Sharples, Milrad, Arnedillo-Sánchez, & Vavoula, 2009; Traxler, 2005). MALL may result in improving the learner's ability to retain information, allowing for building knowledge and understanding in different contexts, addressing different learner needs, providing material to students that would not be able to access

otherwise, or supporting social contact and collaborative learning (Kukulska-Hulme, 2009; Kukulska-Hulme & Shield, 2008; Kukulska-Hulme, Traxler, & Pettit, 2007).

2.1. Open educational resources as educational materials

Some digital learning contents can be accessed and used freely as OERs, that is, any type of educational materials (textbooks, lecture notes, assignments, tests, etc.) in the public domain or introduced with an open license which means that anyone can legally and freely copy, use, adapt and re-share them (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2012). These resources can be freely combined, altered, extended or adapted to suit the particular interests of teachers and learners (Rödel, 2013), usually registered under Creative Commons licenses (Beaven, 2013) or repurposed for language learning (Thomas & Evans, 2014).

In the last decade, the European Union has increased the promotion of OERs since they can facilitate policy dialogue, knowledge sharing and collaboration between states and institutions internationally (Sabadie, Muñoz, Punie, Redecker, & Vuorikari, 2014). Studies on teachers' perception of OERs show that using them may increase productivity in students through increasing their confidence, interest and satisfaction with the task at hand. Moreover, their use encourages reflective practice for educators. Further studies point out that OERs' awareness is growing (Farrow et al., 2015). OERs were found to shorten the time required to prepare lessons (Wenk, 2010), to reduce teacher isolation and help to expand teachers' roles, inspiring them to find alternative and innovative solutions to the development of their classes, and encouraging reflective practice (Farrow et al., 2015; Petrides, Jimes, Middleton-Detzner, & Howell, 2010). Bradshaw, Younie, and Jones (2013) stated that the use of OERs can enhance and support teaching and learning practices. Last but not least, OER materials have been found to reduce costs for teachers and students during the course of the academic year (Bliss, Robinson, Hilton, & Wiley, 2013; Farrow et al., 2015; Wiley, Hilton, Ellington, & Hall, 2012).

The use of OERs in the context of Higher Education has been studied specifically in the recent years (Adams, Liyanagunawardena, Rassool, & Williams, 2013). Wenk (2010) stated that for OERs to be useful, they should be easily accessible, their purpose should be clear, and they should be modifiable to suit the teachers' needs. Conole and Alevizou (2010) pointed out several studies looking at how teachers perceive and use OER materials in their teaching habits (Harley et al., 2006; Hylén, 2006; McAndrew et al., 2009; MIT, 2006, 2009; Petrides, Nguyen, Jimes, & Karaglani, 2008; Wiley & Henson, 2006). The main reasons provided as to why teachers looked for OERs were: (a) to expand their courses with new materials; (b) to improve and intellectually expand their teaching habits, and (c) to interact with colleagues with similar interests (Conole &

Alevizou, 2010). Other studies later on have shown educators' and students' positive attitudes towards the use of ICTs and OERs in learning and work environments, naming usefulness and ease of use as the main reasons behind it (Edmunds, Thorpe, & Conole, 2010; Farrow et al., 2015).

The inclusion of OERs in the classroom also presents challenges to overcome. Numerous studies pointed out that there is an overall lack of knowledge in educators regarding OERs and the ethics behind Creative Commons Licenses and restrictions in the publication and sharing of materials. Other issues include the language barrier, the fact that all the sharing and distribution of digital materials is confined within the e-learning institutions, the time and skills needed to fully use the resources and the lack of reward systems to account for the efforts invested in creating and using OERs (Abeywardena, Dhanarajan, & Chan, 2012; Banzato, 2012; Conole & Alevizou, 2010; Mishra, Sharma, Sharma, Singh, & Thakur, 2016; Rolfe, 2012).

According to Littlejohn and Hood (2017), in order for educators to increase the overall use of OERs in the classroom, they need to possess basic knowledge of the technology, to work in a context that supports teaching and learning through OERs and to feel confident with the usage of such tools. It is therefore essential to show them first the value of OERs to later on build up their competence through specialized courses (Yeung, Taylor, Hui, Lam-Chiang, & Low, 2011), which must show educators what OERs are and how they can be used to address specific needs (Wild, 2012).

Although the efforts for the dissemination of OERs are visible across the EU, they have not yet received the attention needed to draw their fullest potential, and the barriers mentioned above have not been sufficiently addressed. However, studies show there is a growing interest among educators towards knowing and using OERs (Abeywardena et al., 2012; Banzato, 2012; Bliss et al., 2013; Conole & Alevizou, 2010; Farrow et al., 2015; Masterman, Wild, White, & Manton, 2011; Murphy & Wolfenden, 2013; Petrides et al., 2010). OER use and promotion in the EU is still far behind other countries such as the USA or Brazil, with the sole exception of the UK (Sabadie et al., 2014). In Spain, efforts have been focused on higher education and college students, while adult education has not been exploited nearly as much (Romero, Pérez-Mateo, Cabrera, Guitert, & Maina, 2015). Research shows that there is still a scarcity of information about the factors associated with both the familiarity and the frequency of use of OERs that may contribute to the promotion and the spreading of their implementation across learning contexts.

2.2. DDL and language processing technologies as open educational resources

Natural Language Processing (NLP) is the process of understanding, generating, translating and conversing language in written and spoken form automatically

(Nilsson, 2009). Along with the constant development of new and innovative tools that aim to offer as many services to the consumer as possible, the addition of NLP features has opened a promising avenue for future progress in the field of language learning and linguistics (Granger, Kraif, Ponton, Antoniadis, & Zampa, 2007). One of the paths within the ‘avenue’ that the automated processing of natural language has opened has been the ability to use both learners’ meta-learning skills and user-generated data in a learning environment. Johns (1986, 1990, 1991) was one of the first to make use of tools such as concordancers to enhance teaching practices. He encouraged learners to ‘research’ and draw conclusions based on the linguistic data provided, hence coining the term ‘Data-Driven Learning’ (DDL), an inductive approach that makes use of attested uses of language as the main source for language learning rather than teacher-mediated discourse (Karras, 2016; Talai & Fotovatnia, 2012). Despite the limitations identified in the DDL literature (Heather & Helt, 2012; Leńko-Szymańska, 2014; Leńko-Szymańska & Boulton, 2015; Pérez-Paredes, 2010), recent research points to positive appraisal in using linguistic data and DDL in language learning (Ballance, 2017; Charles, 2012, 2014; Chujo & Oghigian, 2012; Conroy, 2010; Karras, 2016). For instance, Quan (2016) attempted merging DDL with mobile devices by creating a concordance-based app to improve academic English. He concluded that the DDL approach is suitable to merge with Mobile Learning; however, learners found it difficult to find answers on their own from an overload of examples, showing that pedagogical support should never be underestimated when using approaches which require learners’ interaction with rich data and language complexity (Pérez-Paredes, 2010). Other experiments on subjects learning high-frequency words in English through corpus data through *LexTutor* software showed that the method improved long-term vocabulary retaining and transferring to new texts (Cobb, 1997, 1999). Other researchers have focused on the application of corpora for language acquisition in the classroom, showing varying degrees of success (Allan, 2006; Boulton, 2010; Kaur & Hegelheimer, 2005; Lee & Liou, 2003; Sun & Wang, 2003; Yoon & Jo, 2014). Further studies have also looked at how NLP influences the acquisition of the different language skills (Granger et al., 2007; Harbusch, Itsova, Koch, & Kühner, 2013; Meurers, 2015; Nagata, 2013; Sato, Matsunuma, & Suzuki, 2013). Given the potential identified in DDL and its accessibility to learners via computers, studies focusing on using language processing technologies and DDL are needed so as to gain a better understanding of how DDL could be implemented in MALL.

Previous research has established NLPTs as resources that can be digitally repurposed for pedagogical means (Thomas & Evans, 2014). As free and open versions of these tools are found on the Internet, they fit into the definition of OERs (Beaven, 2013; Rödel, 2013; Thomas & Evans, 2014; UNESCO, 2012). This paper will explore the extent to which OER NLPTs are actually known and used by language teachers across different educational levels in Spain and the

UK. Such analysis attempts to offer further insight on the possible future applications of the DDL approach in the classroom through the use of OER NLPTs, answering the following research questions:

- (1) To what extent are language teachers familiar with the use of mobile devices in the UK and Spain? Do teachers use them for language teaching?
- (2) To what extent are language teachers familiar with OER NLPTs in the UK and Spain? Do they use them at all? If so, what resources are most widely used?

3. Language processing OERs: the teacher perspective

3.1. Research methodology

A survey was used (Owen, 2017) to look at the extent to which L2 teachers are aware and use OER NLPTs and mobile devices in their practice. A questionnaire designed as a result of a literature review of existing resources as well as a discussion and input from experts within the working group was created as a method of data collection. The extensive literature review behind the questionnaire was part of ERASMUS+ TELL-OP, an EU strategic partnership that seeks to promote the use of learner-generated language for learning purposes.

The online questionnaire was developed ad hoc for this study, following standard guidelines for questionnaire creation as a multinational and multilingual survey (de Leeuw, Hox, & Dillman, 2008; Harkness, 2008). It comprised 21 questions with different response format (yes/no, Likert-type anchored 1–5, and open questions). They were divided into three separate sections: Block A dealt with subject demographics, including gender, age, or experience in the classroom among others (e.g. Please indicate how many years of experience in teaching you have); Block B included questions related to the usage of mobile devices (e.g. Does your institution foster the use of mobile devices (mobile phones, tablets, etc.) in the teaching context?), while Block C addressed the interest (e.g. ‘Are you interested in knowing more about OERs?’), familiarity and frequency of use of language-related OERs in the classroom. The last part of the questionnaire was restricted to those informants who had experience in the use of OERs. The survey was conducted in June 2015 and was delivered online following standard procedure guidelines for Internet-based questionnaires (Manfreda & Vehovar, 2008). The online platform *LimeSurvey* was used for its distribution, as it offered a wide variety of tools for creating questionnaires and visualizing the results.

The technologies presented in the questionnaire were selected with the intent of covering as many available types of tools as possible, thus aiming for a high relevance of the survey for the users’ needs (de Leeuw et al., 2008). A thorough research was carried out for each of the NLPTs present to ensure that there were

free and open options to explore, fitting thus the definition of OER. In order to make sure that the respondents were referring to OER NLPTs, examples of freely available tools were provided in each tool's question. The technologies selected addressed different learning skills, such as vocabulary acquisition (online dictionaries, Wordnet), writing skills (spell checkers), reading skills (readability indexes, text summarization tools) and general language awareness tools (Parts-of-Speech taggers). A sample of the survey can be found in <http://www.telop.eu/wp-content/uploads/2015/09/TELL-OP-Survey-ENG.pdf>.

Descriptive statistics were produced based on demographic, teaching and relationship with OER NLPTs data and are presented as percentages or means and standard deviation (SD). Chi-square tests were used for comparison between qualitative variables, and Spearman Rank-order correlations were used for familiarity and frequency of use. The data of the OERs-related scores (familiarity and frequency of use) were not normally distributed as shown by the Kolmogorov–Smirnov Test. Hence, non-parametric Mann–Whitney-*U* tests, or Kruskal–Wallis when appropriate, were applied to analyse differences between groups. All statistic tests were two-tailed, with significance set at $p < .05$. All statistical analyses were performed with SPSS 22.0 for Windows (SPSS; Chicago, IL, USA).

3.2. Participants

The questionnaire was distributed among language teachers through social media and email lists in the areas of applied linguistics, CALL, language teaching and corpus linguistics, following a non-probability sampling, more concretely, a convenience sampling. The dissemination strategy included professional email lists such as EUROCALL, BALL, AESLA, Corpora list, and CALICO as well as contact with Language Schools and Language Academies, Teachers' Unions and Universities through Twitter. For the purpose of this research, we will focus solely on the results collected from teachers based in Spain and the UK (131 from Spain and 99 from UK).

Table 1 describes the main characteristics of the sample collected. Participants were mostly women aged between 36 and 55; the participants' backgrounds were mostly in Modern Languages, Applied Linguistics, Education and Language and Literature, and Higher or Secondary education were the most common institutions represented in the survey results. The qualification for educators based in Spain was mostly PhD (38.93%), while the UK-based participants were BA and MA (39.39% in both cases). Most of the teachers in Spain had between 11–15 years of experience in teaching (29.01%), while most of the UK-based subjects had 16–20 (27.27%). Almost three out of four participants from Spain taught English as a foreign language while 'Other languages' and French were most common in the UK.

Table 1. Characteristics of the participants.

	Spain		UK	
	N	%	N	%
Gender				
Male	42	32.06%	20	20.20%
Female	89	67.94%	79	79.80%
Age				
<25	1	0.76%	1	1.01%
26–35	22	16.79%	24	24.24%
36–45	55	41.98%	27	27.27%
46–55	44	33.59%	37	37.37%
> 56	9	6.87%	10	10.10%
Qualification				
BA	43	32.82%	39	39.39%
MA	26	19.85%	39	39.39%
PhD	51	38.93%	7	7.07%
Other	11	8.40%	14	14.14%
Training background				
Applied linguistics	49	37.40%	10	10.10%
Education	52	39.69%	51	51.52%
Linguistics	25	19.08%	14	14.14%
Modern languages	63	48.09%	83	83.84%
Language and literature	32	24.43%	32	32.32%
Other	16	12.21%	12	12.12%
Years of experience				
<3 years	4	3.05%	6	6.06%
3–5	9	6.87%	7	7.07%
6–10	16	12.21%	16	16.16%
11–15	38	29.01%	13	13.13%
16–20	27	20.61%	27	27.27%
21–25	16	12.21%	17	17.17%
>26	21	16.03%	13	13.13%
Working institution				
A higher education institution	58	44.27%	27	27.27%
A vocational training institution	7	5.34%	1	1.01%
An adult education institution	19	14.50%	1	1.01%
A secondary school institution	30	22.90%	56	56.57%
A primary school institution	26	19.85%	14	14.14%
Other	12	9.16%	11	11.11%
Language taught				
English as FL	94	71.76%	4	4.04%
English as SL	10	7.63%	3	3.03%
French as FL	8	6.11%	32	30.32%
French as SL	1	0.76%	10	10.10%
Others	18	13.73%	50	50.50%

4. Results

4.1. RQ 1. Technology and mobile devices in the classroom

Most of the language teachers surveyed claimed that their institution provided them with WiFi connection (Spain: 83.97%; UK: 87.88%). Although they estimated their own computer skills as medium-high (41.22% scored 3–4 in a scale from 1 to 5, where 5 would be ‘expert computer skills’), some differences were observed between countries, Spain-based educators overall claiming to be more skilled than UK-based teachers. Institutions fostering the use of mobile devices are reported more frequently in the UK (68.69%) than in Spain (51.15%) ($\chi^2 = 7.16$; $p = .005$); and a similar pattern is found for lack of training

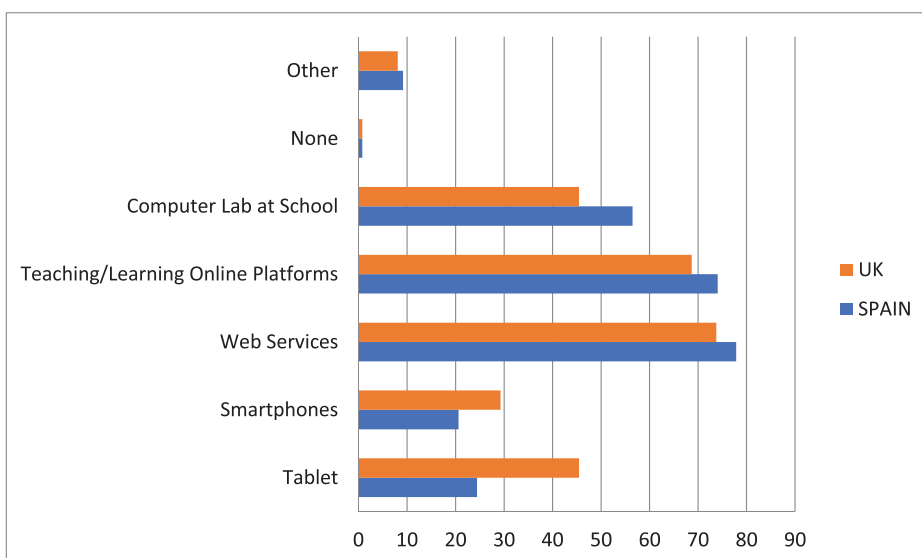


Figure 1. Frequency of use of different types of devices in the classroom.

in the use of mobile devices (Spain: 76.34% vs. UK: 65.66%), although not reaching significance ($\chi^2 = 3.17$; $p = .052$).

Figure 1 shows the frequency of use of different types of devices in the subjects' language teaching. The general response leaned towards web services and teaching/learning online platforms (Between 65% and 80% in both countries), while smartphones were the least used. Main between-country difference shows that UK respondents appear to use tablets more frequently (UK: 45.45%; Spain: 24.43%; $\chi^2 = 11.19$; $p = .001$). Additionally, although not statistically significant, a higher percentage of UK teachers use smartphones (UK: 29.29%; Spain: 20.61%), while Spanish teachers rely more frequently on computer labs at school (Spain: 56.49%; UK: 45.45%). When asked for the frequency with which teachers used mobile devices in the classroom, the highest percentage answered 'never' (Spain: 25.19%; UK: 28.3%), followed by 'a few times a year' (Spain: 22.14%; UK: 25.3%); while about one third said to use them at least on a weekly basis (Spain: 35.1%; UK: 32.3%).

4.2. RQ 2. Natural language processing technologies as open educational resources

When teachers were asked whether they were familiar with OERs, significant between-country differences were found ($\chi^2 = 23.59$; $p < .001$). In Spain, most of the respondents (41.98%) reported to be familiar with OERs, 22.14% had heard of them but never used them, while 35.88% did not know anything about OERs. The results collected from UK-based educators show that fewer subjects claimed to be familiar with OERs (24.24%) or had 'heard of them but never

used them' (8.08%), while 67.68% claimed not knowing about them. However, interest in knowing more about OERs was equally widespread among teachers in both countries (Spain: 82.44% vs. UK: 82.83%).

Among those who confirmed that they were familiar with OERs (84 and 31 subjects in Spain and UK, respectively), there were no apparent between-country differences. Most of the sample never use OERs in the context of language teaching or only use them a few times a year (Spain: 60.71%; UK: 56.26%) (Table 2).

In the following items, a set of various Natural Language Processing Technologies as Open Educational Resources was presented to the informants for them to indicate the extent to which they were familiar with and how frequently they used each one.

Figure 2 shows the mean scores for the familiarity with OER NLPTs and frequency of use respectively. The OER NLPTs teachers are most familiar with are Online Collocation Dictionaries, Spell Checkers and Language learning apps. However, only the first shares the same ranking in both familiarity and frequency of use. On the opposite side, Vocabulary Profiling, Text density/readability index and automated POS tagging are the least known in terms of both familiarity and frequency of use. Teachers' familiarity levels were found to be higher than their frequency of use for all the NLPTs. As expected, Spearman Rank-order Correlations between familiarity and use were found to be significant ($p < .001$) for every OER in the questionnaire. That is, teachers' familiarity level is significantly associated with how frequently they use a certain NLPT as OER.

Significant between-country differences were found in the familiarity with *online collocation dictionaries or databases* ($U: 655.5; p < .001$), *text summarization* ($U: 1016; p = .016$), *L1 corpora* ($U: 987; p = .021$), *specialized corpora* ($U: 998; p < .023$), and *learner corpora* ($U: 1039; p = .042$). Only *online collocation dictionaries* ($U: 932.5; p = .009$) was significantly different for frequency of use though. In all cases, teachers based in Spain showed higher means for both familiarity and use than those from UK.

Training in the use of mobile devices ($U: 3799; p < .001$), and fostering their use in the classroom ($U: 3835; p < .001$) appears to have a relevant association with the frequency of use of such devices but little impact on familiarity or

Table 2. Results for teachers' frequency of use of OERs.

	How often do you use OERs in the context of language teaching?	
	Spain	UK
Never	28.57%	34.38%
A few times a year	32.14%	21.88%
Monthly	13.10%	15.62%
On a weekly basis	19.05%	21.88%
Everyday	7.14%	6.25%

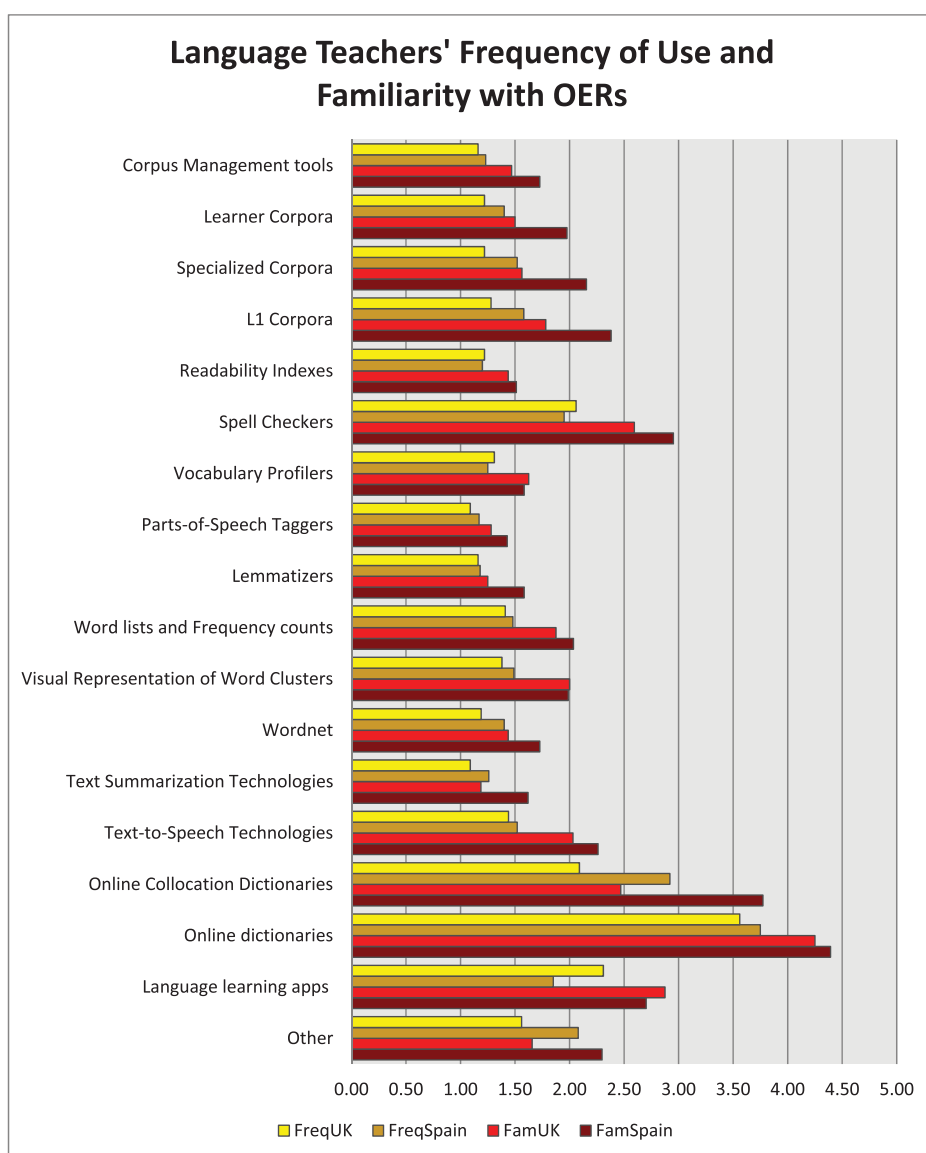


Figure 2. Teachers' familiarity and frequency with OERs.

frequency of use of OER NLPTs. Only the frequency of use of *L1 corpora* is significantly associated ($U: 1157; p = .035$) to training. When institutions foster the use of mobile devices in the teaching context, teachers use such devices more frequently ($U: 3835; p < .001$). However, when analysing specific OERs, associations are scarce, and fostering significantly increases only familiarity with *online dictionaries* ($U: 1331.5; p = .031$), and frequency of use of *L1 corpora* ($U: 1392; p = .046$).

Institutional affiliation shows significant differences in the familiarity with OER NLPTs (with the exception of *Text-to-Speech technologies*, *Language*

learning Apps, *Online Dictionaries*, *Visual representation of Word Clusters* and *Spell Checkers*), the most significant being *Readability Indexes* and all corpora-related tools. This association does not extend to frequency of use except for *L1 corpora* and *Specialized corpora*. However, it must be noted that although the difference leans towards higher scores for HE teachers, the overall scores for both familiarity and frequency of use are still very low (see [Appendices 1](#) and [2](#)).

The qualification of the teachers surveyed suggests that the higher their qualification, the more likely the subject is of being familiar with a certain tool (see [Table 2](#)). The biggest difference can be found in all corpora tools, *TTS*, *Lemma-tizers* and *Vocabulary Profiling tools*. Subjects with a PhD present overall higher scores for familiarity than MA subjects, which in turn present higher scores than BA subjects, although, again, the differences were mainly non-significant for frequency of use. Frequency of use of mobile devices shows no difference regarding qualification or workplace, as with familiarity and use of *language learning apps* or *spell checkers*.

Other variables like gender, age group or years of teaching experience showed no association with either familiarity or frequency of use in any of the NLPTs studied. The only significant association was found between being male and familiarity with *language learning apps* ($U: 970.5; p = .005$).

5. Discussion

Our results offer a snapshot of how mobile devices, MALL and OER NLPTs are perceived and used by language teachers in the UK and Spain. The fact that the vast majority of the institutions offer connection to the Internet for teachers suggests that, presumably, most of them are able to access the resources during lessons at any time. It was also found that the promotion of the use of mobile devices in the classroom is not widespread, with half of the respondents claiming that their institutions foster the inclusion of mobile devices in the classroom. This finding suggests that institutions are gradually working towards the integration of mobile devices in official curricula. However, most of the subjects claimed not having received any training whatsoever in how to do this. The UK seems to be ahead of Spain in terms of both encouraging and offering training in the use of mobile devices. Among the devices that teachers utilize, smartphones and tablets appear to be the least used in contrast with computer labs, teaching/learning online platforms or web services, which is consistent with the widespread lack of training in mobile devices use. In terms of frequency of use of mobile devices, the general tendency among those surveyed leans towards a low usage of mobile devices in the classroom, with almost half of the respondents claiming not to use them more than a few times a year. Although institutions in the UK seem to favour the inclusion of mobile devices in the classroom, Spain-based teachers apparently make use of mobile devices more frequently than their UK-based counterparts. However, when the results from both

countries were compared, significant differences could not be found that would suggest a higher use of mobile devices either in Spain or the UK.

As for OERs, most of the respondents claimed not knowing much about them, but the vast majority (Spain: 82.44%; UK: 82.83%) showed interest in acquiring more knowledge on OERs. Our results support the claim that it is necessary to have acquired a basic knowledge about OER NLPTs and their capabilities in order to build up and spread their usage (Littlejohn & Hood, 2017; Wild, 2012; Yeung et al., 2011). The generally low rate of familiarity and frequency of use suggests that there currently exists a widespread lack of knowledge about OER NLPTs and what they can be used for (Abeywardena et al., 2012; Banzato, 2012; Conole & Alevizou, 2010; Mishra et al., 2016; Rolfe, 2012), which seems to indicate that more awareness initiatives are needed to increase their potential use (Kukulska-Hulme, 2016) or, alternatively, that the existing ones are not being effective enough to create a solid base of knowledge that supports the increasing implementation of language-related NLPTs in the classroom. The results also align with previous surveys on educators (Farrow et al., 2015) which point out the low usage of OERs as well as the positive attitudes towards its use in the teaching context.

Focusing on the individual OER NLPTs, *Online Dictionaries*, *Collocation Dictionaries* and *Spell Checkers* were the most widely known, whilst resources such as *Lemmatizers*, *POS Taggers*, *Vocabulary Profiling tools* and *Readability Indexes* were the least known among the language teachers surveyed. The main purposes for using tools such as *Online Dictionaries* or *Spell Checkers* seem to be the improvement of lexical knowledge and writing skills, as found in studies of language learning and teaching in mobile environments (Charles, 2012, 2014; Chujo & Oghigian, 2012; Geluso, 2013; Karras, 2016; Ma, 2016; Quan, 2016). However, most MALL studies have focused on vocabulary learning using memory-based, repetition-based or multiple-choice exercises, setting them apart from other vocabulary learning and writing tools such as *Vocabulary Profilers*, *Wordnet* or different types of corpora, which, in the context of DDL, could offer a more learner-centred experience and individualized and personalized learning. These tools also require a steeper learning curve to be used properly, and most of them have received mobile support only quite recently. This could explain the differences in familiarity among vocabulary learning and writing skills-oriented tools whereas *Online Dictionaries*, *Collocation Dictionaries* and *Spell Checkers* are more widely known. This finding suggests that, given the teachers' limited knowledge, there is plenty of room for the dissemination of OER NLPTs that promote language learning experiences that are (1) geared towards a more integrated view of language learning skills and (2) favour more personalized learner experiences. Regarding the remaining types of tools, studies such as Steel (2016) and Ma (2016) suggest that learners also seem to favour vocabulary learning over other language skills, using smartphones to browse web contents and use dictionary apps, using marginally language learning apps and vocabulary lists.

Ballance (2017) has suggested that the limited uptake of concordancers in mainstream language learning can be explained by factors such as the difficulty in their use, the insufficient existing training to take advantage of their capabilities and the limited access to the resources. Tools that can be perceived as more sophisticated such as *Lemmatizers*, *Readability Indexes* or *POS taggers* are more likely to see their rate of use significantly decreased among language teachers who are not actively pursuing the design and writing of materials.

Previous research has showed that for OER NLPTs to expand their reach, they need to be accessible and easy to use (Wenk, 2010). Our informants' habits seem to confirm these statements as, for example, *dictionaries* and *spell checkers* offer quick, direct and concise results both on desktop and mobile devices, are mostly freely accessible and are easy to use. This paper argues that the use of OER NLPTs that require some degree of sophistication and training need to be adapted and presented in ways that contribute to learning experiences that reinforce the pedagogical contributions while they decrease the challenges and obstacles involved in using OERs which do not necessarily present pedagogical user interfaces (Pérez-Paredes, 2010). As a matter of fact, accessibility and familiarity are crucial factors. Conroy (2010) experimented with students using Google search for concordancing, with the results stating that they managed better and showed more improvement than when they used a proper concordancing tool. Familiarity and ease of use were said to be crucial in explaining such improvement in performance. Geluso (2013) also studied the use of Google for language learning purposes, showing significant increase in the naturalness of the subjects' writing, while Pérez-Paredes, Sánchez-Tornel, and Calero (2012) found that even after dedicated corpus training, students' queries on the British National Corpus (BNC) resembled their query behaviour on Google.

There are, however, other factors that may influence the use of many of these resources. Our results showed that teachers' qualification plays a significant role in the adoption of NLPTs as OER, as PhDs tended to be more familiar with tools that might be considered 'advanced' such as different types of corpora, *POS taggers* or *Lemmatizers* than subjects with BAs or MAs. Our results show that mobile devices appear to be underused in foreign language teaching. The teachers surveyed tend to use computer-based environments (online platforms, computer labs or web services) rather than taking advantage of mobile devices such as smartphones and tablets. Although some researchers have stated that mobile apps were paving the ground for innovative practices in mobile learning (Godwin-Jones, 2008), early studies in the performance of learning activities on smartphones suggested a low usage of mobile devices with respect to computers (Stockwell, 2010), mainly influenced by the technological constraints of the moment in which smartphones had recently become mainstream and tablets did not exist yet. More recent studies, however, point out to users perceiving language learning apps as limited in pedagogical variance and immature (Steel, 2016). This suggests that more studies that focus on pedagogical affordances

rather than technology are needed in CALL if one is to transfer some of the affordances of desktop computers (Pérez-Paredes, 2010) to mobile devices.

OERs have been found to contribute to improving language learning and teaching in multiple ways (Bliss et al., 2013; Bradshaw et al., 2013; Farrow et al., 2015; Sabadie et al., 2014; Wenk, 2010; Wiley et al., 2012). The continuous use of these resources contributes to the personalization of the learning experience, creating a new skillset in data literacy and allowing for a growing role for multi-modality in meaning-making (Pegrum, 2016). OERs also help develop context-aware language learning through MALL (Traxler & Kukulska-Hulme, 2016) and promote the individualization and personalization of the learning process (Kukulska-Hulme, 2016). Our results suggest that both lack of teachers' familiarity and use of such resources may be depriving language learners of opportunities to further enhance their learning experiences in MALL contexts. Although OERs have been established lately as highly beneficial, the inclusion of NLPT as OERs in the classroom comes with a series of challenges that must first be faced: (i) This study has focused on NLPTs that are freely available; (ii) Accessibility and ease of use have been named numerous times as crucial factors in the potential usability of a resource (Conroy, 2010; Geluso, 2013), therefore those lesser-used tools need more user-friendly interfaces to increase their use; (iii) The fact that technology and pedagogic practices evolve at different speeds must be considered as well, suggesting a longer effort in updating the studies being carried out and a constant online support when developing tools that enhance teaching and learning.

The general attitude shown towards the use of OER NLPTs is positive, aligning with the findings in the literature (Conole & Alevizou, 2010; Edmunds et al., 2010; Farrow et al., 2015), and the vast majority of the teachers showed interest in knowing more about OERs. This suggests that further attempts on promoting the use of OER NLPTs, such as designing training programs directed to educate teachers on the proper use of OER NLPTs, would be well received and therefore more likely to succeed. The constant development of technology, the evolution of pedagogic practices as well as societal changes have made digital competence a key part of contemporary education. Given the low levels of use of mobile devices and dedicated NLPTs in the language classroom both in the UK and Spain, it may be necessary to create conversations between teachers and learners, among learners and between learners and technology so as to make knowledge and reasoning more explicit, thus promoting more diverse learning opportunities. It seems plausible to think that language teachers in other European countries may present similar familiarity rates with the range of OERs discussed in our research, which suggests that the findings in this paper may attract the interest of language professionals beyond the UK and Spain.

By using NLPTs and mobile devices, learning is likely to become more closely intertwined with the learners' personal daily experiences as OERs allow for learning to take place outside the classroom, facilitating the development of

user-generated content. The use of OER NLPTs and apps through mobile devices is part of a teaching strategy that considers, and most likely changes, how, when and where teachers and learners interact with each other and with other means of personalization of the learning experience, allowing as well for the exploration of authentic language problems and challenges that may arise in the learner's everyday life.

6. Conclusion

This study has offered further insight into how mobile devices and NLPTs are perceived and used by language teachers in Spain and the UK. Our findings are of importance for language professionals, material designers and CALL researchers interested in implementing MALL that makes use of language-processing-related resources. This article argues that OER NLPTs through mobile devices, if considered as valuable resources in the current landscape of language learning and teaching, may play an important role in shifting pedagogic approaches towards more learner-centred models, in raising learners' language awareness and in promoting personalized learning experiences.

There are limitations in our research that must be taken into account. Although our sampling strategy has been widely adopted in similar types of research, a study with a broader number of subjects would yield more definite conclusions. The use of different professional email lists may have arguably provided us with a different sample, which may have potentially affected the nature of our discussion. Similarly, a questionnaire of learners' use of language-related OERs may have provided us with a more complete picture of the language learning landscape.

This research has unveiled a low rate of both familiarity and use of mobile devices and OERs, among the language teachers in the UK and Spain that completed our questionnaire. This paper also tried to shed light into the challenges and opportunities that the use of NLPTs may create in the context of mobile language teaching and learning. The fact that educators are not sufficiently aware of the possibilities of using OER NLPTs may be depriving language learner of chances to engage with learning opportunities that are not promoted in commercial MALL. It appears that the efforts to promote the use of mobile devices and general-purpose language learning OERs in the classroom have not been sufficient or effective enough. Further research may focus on the pedagogical implications of the inclusion of OER NLPTs in such contexts.

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Appendices

Appendix 1. Mann–Whitney U tests for teachers' workplace and familiarity and frequency of use of MD and OERs

	Higher education vs. secondary education	<i>p</i>
Frequency of use of mobile devices	3,232.000	.414
Frequency of use of OERs	653.500	.846
Frequency of use of OERs in teaching	571.000	.399
Familiarity with language learning apps	735.500	.815
Familiarity with online dictionaries	603.000*	.037
Familiarity with collocation dictionaries	4915**	.001
Familiarity with text-to-speech	720.000	.948
Familiarity with text summarization tools	5585*	.115
Familiarity with use of Wordnet	529*	.296
Familiarity with visual representation of Word clusters tools	620.000	.554
Familiarity with Word lists	5125*	.031
Familiarity with lemmatizers	485**	.001
Familiarity with POS taggers	5215**	.004
Familiarity with vocabulary profilers	4905**	.001
Familiarity with spell checkers	661.500	.443
Familiarity with readability indexes	476***	.002
Familiarity with L1 corpora	2585***	.001
Familiarity with specialized corpora	3155***	.001
Familiarity with learner corpora	337***	.001
Familiarity with corpus management tools	383***	.001
Frequency of use of language learning apps	665.000	.991
Frequency of use of online dictionaries	598.000	.181
Frequency of use of collocation dictionaries	642.500	.100
Frequency of use of text-to-speech	721.500	.456
Frequency of use of text summarization tools	698.500	.154
Frequency of use of Wordnet	632.000	.448

(continued)

	Higher education vs. secondary education	<i>p</i>
Frequency of use of visual representation of Word clusters tools	668.500	.385
Frequency of use of Word lists	661.500	.575
Frequency of use of lemmatizers	698.500	.571
Frequency of use of POS taggers	723.500	.704
Frequency of use of vocabulary profilers	689.000	.452
Frequency of use of spell checkers	671.500	.620
Frequency of use of readability indexes	732.500	.676
Frequency of use of L1 corpora	498**	.017
Frequency of use of specialized corpora	5585*	.021
Frequency of use of learner corpora	627.500	.251
Frequency of use of corpus management tools	658.500	.277

Appendix 2. Differences between teachers' qualification and familiarity and frequency of use of MD and OERs

	BA (mean)	MA (mean)	PhD (mean)	Kruskal–Wallis Htest	<i>p</i>	Mann– Whitney U test
Frequency of use of mobile devices	2.70	2.58	2.97	2.859	.414	
Frequency of use of OERs	2.44	2.79	2.62	0.816	.846	
Frequency of use OERs in teaching	2.04	2.45	2.64	2.952	.399	
Familiarity with language learning apps	2.85	2.70	2.67	0.942	.815	
Familiarity with online dictionaries	4.04	4.30	4.60	8.465*	.037	(BA–PhD) $U = -17.750$ $p = .020$
Familiarity with collocation dictionaries	3.15	3.21	4.05	16.446***	.001	(MA–PhD) $U = -20.345$ $p = .006$ (BA–PhD) $U = -19.368$ $p = .018$
Familiarity with text-to-speech	2.15	2.12	2.31	0.363	.948	
Familiarity with text summarization tools	1.44	1.27	1.71	5.931	.115	
Familiarity with use of Wordnet	1.52	1.52	1.83	3.701	.296	
Familiarity with visual representation of Word clusters tools	1.78	2.15	2.00	2.089	.554	
Familiarity with word lists	1.56	1.94	2.33	8.861*	.031	(BA–PhD) $U = -20.250$ $p = .010$
Familiarity with lemmatizers	1.07	1.33	1.88	17.432***	.001	(BA–PhD) $U = -24.626$ $p = .001$
Familiarity with POS taggers	1.15	1.36	1.62	13.245**	.004	(BA–PhD) $U = -19.590$ $p = .003$
Familiarity with vocabulary profilers	1.07	1.88	1.71	16.692***	.001	(BA–MA) $U = -24.327$ $p = .001$ (BA–PhD) $U = -22.892$ $p = .001$
Familiarity with spell checkers	2.67	2.85	3.10	2.683	.443	
Familiarity with readability indexes	1.19	1.55	1.69	14.960**	.002	(BA–PhD) $U = -23.253$ $p = .001$

(continued)

	BA (mean)	MA (mean)	PhD (mean)	Kruskal–Wallis Htest	<i>p</i>	Mann– Whitney U test
Familiarity with L1 corpora	1.37	2.27	2.83	26.662***	.000	(BA–MA) <i>U</i> = −21.709 <i>p</i> = .010 (BA–PhD) <i>U</i> = −35.112 <i>p</i> = .001
Familiarity with specialized corpora	1.33	1.88	2.62	27.093***	.000	(BA–PhD) <i>U</i> = −33.664 <i>p</i> = .001 (MA–PhD) <i>U</i> = −19.556 <i>p</i> = .008
Familiarity with learner corpora	1.33	1.76	2.36	20.946***	.000	(BA–PhD) <i>U</i> = −28.824 <i>p</i> = .001
Familiarity with corpus management tools	1.15	1.52	2.12	23.373***	.000	(BA–PhD) <i>U</i> = −30.608. <i>p</i> = .001 (MA–PhD) <i>U</i> = −16.605 <i>p</i> = .018
Frequency of use of language learning apps	2.11	1.97	1.95	0.107	.991	
Frequency of use of online dictionaries	3.52	3.55	3.93	4.875	.181	
Frequency of use of collocation dictionaries	2.70	2.30	3.12	6.255	.100	
Frequency of use of text-to-speech	1.30	1.48	1.64	2.606	.456	
Frequency of use of text summarization tools	1.15	1.12	1.29	5.255	.154	
Frequency of use of Wordnet	1.22	1.21	1.48	2.653	.448	
Frequency of use of visual representation of Word clusters tools	1.26	1.36	1.57	3.040	.385	
Frequency of use of word Lists	1.26	1.36	1.60	1.988	.575	
Frequency of use of lemmatizers	1.15	1.12	1.21	2.004	.571	
Frequency of use of POS taggers	1.15	1.09	1.17	1.406	.704	
Frequency of use of vocabulary profilers	1.11	1.36	1.29	2.632	.452	
Frequency of use of spell checkers	1.81	1.91	2.21	1.778	.620	
Frequency of use of readability indexes	1.19	1.24	1.19	1.525	.676	
Frequency of use of L1 corpora	1.11	1.45	1.81	10.235*	.017	(BA–PhD) <i>U</i> = −17.750. <i>p</i> = .020
Frequency of use of specialized corpora	1.15	1.27	1.76	9.756*	.021	(BA–PhD) <i>U</i> = −15.799 <i>p</i> = .014
Frequency of use of learner corpora	1.15	1.21	1.55	4.096	.251	
Frequency of use of corpus management tools	1.11	1.12	1.29	3.857	.277	

Note: Differences between teachers' qualification and familiarity and frequency of use of MD and OERs.

* $p < .05$; ** $p < .01$; *** $p < .001$