

Can WordBricks make learning Irish more engaging for students?

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ABSTRACT

Learning a language is challenging and it is important that learners are kept motivated throughout the process. Many Irish primary school children are not particularly motivated to learn the language and there are few Computer Assisted Language Learning (CALL) resources available to them. WordBricks is an app that enables learners to construct only grammatically correct sentences. It leverages a visual learning paradigm and has a Scratch-like interface. It was originally developed for English, and more recently has been expanded to cater for Irish. This article investigates if using Irish WordBricks is both suitable and usable for primary school learners, if it is pedagogically appropriate for them and if it is enjoyable for them. The WordBricks app was tested by five classes of two different age groups in a typical school in Ireland. This article reports on the results of the WordBricks deployment and the feedback of students and teachers.

Keywords: Computer Assisted Language Learning, Irish, game-based learning, WordBricks, young learners, language learning app, gamification, Mobile Assisted Language Learning, Minority Languages

INTRODUCTION

Irish is a core subject in both primary and secondary schools in Ireland. There are very few technology resources available for the language as there are limited commercial incentives for companies to develop such resources. Furthermore, it is not a particularly popular subject with students due to motivational and pedagogical issues and there are very few interactive resources for teachers and learners. The aim of this research was to see if a WordBricks app (Purgina, Mozgovoy, Ward, 2017), which helps students construct grammatically correct sentences in Irish, could make learning more interesting and engaging for them. There were three research questions to answer: a) Would a WordBricks app developed for English and adapted for Irish be suitable and usable by the target user community? b) Would the app be pedagogically appropriate? and c) Would the teachers and students enjoy using the app? The target user group was primary school children learning Irish. The Irish WordBricks app was built using the original WordBricks app infrastructure and adapted to include Irish grammatical construction and vocabulary. The app was tested by 5 different classes in a primary school in Ireland, and this paper reports on the findings of that research.

BACKGROUND

Language Learning

Learning a language can be an interesting experience for some and challenging for others. There are many factors involved in how successful someone is at learning a language. One

interesting factor is how useful or relevant a language is in the perception of the learner. Many students throughout the world learning English as a Foreign Language as it is the (current) global language. While they may not enjoy the experience, they can at least understand why they have to learn it and their parents probably value the opportunity their children have to learn the language. However, the issue of learning a language for non-utilitarian reasons complicates the language learning process. If the parents do not see the value in learning the language, their lack of support or indeed, negative attitudes towards the language can militate against their children's language learning journey. Motivation is a key facet of successful language learning. This can be either intrinsic or extrinsic or a mixture of both. In recent years, scholars have continued to research language learning motivation and pointed out that this intrinsic/extrinsic dichotomy is too simplistic and that the topic of motivation in language learning is more complex (Dörnyei & Ushioda, 2013; Ushioda, 2013). Devitt et al., (2018) provide an interesting overview of primary pupils' attitudes to Irish.

Irish Language

Irish is one of the two national languages of the Republic of Ireland. It is on the Goidelic branch of the Celtic language family and has a long written history and oral tradition. It was the L1 (first language) of the vast majority of the population of Ireland, but the number of speakers has continued to decline from the middle of the 19th century. Depending on the definition of a speaker, it has between over one million speakers or 20,000 speakers who use the language on a daily basis. The majority of the one million speakers use Irish in the education system (as it is a compulsory subject in schools) so the true number of speakers is probably closer to 20,000 speakers. There are three main dialects of Irish: Munster, Connaught and Ulster which are spoken by native speakers. However, 'Standard' Irish is taught in schools. This is a standard that was defined in 1958 and is a combination of features from each of the three dialects. Due to its long written tradition, there is quite a divergence between the written and the spoken forms of the language. For example, the name Aoife (Eva or Ava in English) is pronounced as 'ee + fa'. The word for week is '*seachtain*' and is pronounced as 'shock + ten'. This causes a problem for children, whose first language is English, when they start learning Irish. They tend to map English pronunciation onto Irish words, but this is not an effective strategy due to the divergence between the two different writing systems. Another problem that learners often encounter is that their teacher speaks one variety of Irish (dialect or Standard) and the next year a different teacher uses another variety. Young students do not know there are different varieties and they can find this very confusing.

Game-like CALL Environments

Computer Assisted Language Learning (CALL) has been around for many years. CALL research relates to the use of computing technology in the language learning process (Levy, 1997; Beatty, 2013; Levy & Stockwell, 2013). CALL covers the four aspects of language learning: reading, writing, listening and speaking. It is used for all aspects of language teaching and learning from phonemes through to pragmatics. Game-based language learning is one of the sub-domains of CALL and is emerging as an area of active research interest in recent years, particularly that of Mobile Assisted Language Learning (MALL) (Holden & Sykes, 2011; Kukulska-Hulme, 2009; Kukulska-Hulme, 2012; Stockwell, 2012).

Cornillie, Thorne and Desmet (2012) outline a two-category framework for game-like CALL environments. These are game-like environments which may have learning objectives and goals and toys which lack gaming goals and are less structured. Reinhardt and Sykes (2014)

outline a three-category framework. In their framework, there is a game-enhanced category which uses commercial off-the shelf (COTS) games designed for entertainment purposes, the game-based category uses educational or learning-purposed games and the game-informed category, where game and play principles are used in contexts that are not usually considered a game. The term *game-informed* is probably appropriate for the WordBricks app as it is a learning app designed for mobile devices that draws on ideas and principles from games. It uses light-touch gamification in that it has some elements of gaming, but lacks other features such as social interactions and challenges. Kim and Kwon (2012) point out that MALL apps often focus on form especially at the lexical level and work on receptive skills rather than productive skills. This is mainly because it is easier to develop these types of resources. Dealing with a learner's written and spoken input is more challenging due to the inherent difficulties associated with Natural Language Processing (NLP). However, the Work Bricks app enables learners to create sentences, thus enabling them to test their productive skills. With WordBricks, learners can make sentences using pre-defined part of speech blocks without the need to actually type in the words. This enables them to by-pass the problems of a difficult orthography as students can often be distracted by the task of spelling words correctly and lose focus on the grammatical construct that is the real learning objective.

There are many studies on the effects of gamification in the classroom and the results have been mixed. Hanus and Fox (2015) report some interesting results including the fact that gamified students were less motivated, empowered and satisfied over time. They noted that gamified courses can negatively affect exam grades through their impact on intrinsic motivation. They state that gamified systems that feature rewards strongly may have a negative effect. Mekler et al., (2017) state that points, levels and leaderboards act as indicators to learners. Landers, Bauer and Callan (2017) report that leaderboards increased performance and recommend that goal setting should be explored in gamification. Users' acceptance of gamified systems depends on their prior experience with and their overall attitude towards games Technology-Enhanced Training Effectiveness Model (Landers & Callan, 2012). In their study of the Technology-Enhanced Training Effectiveness model (Landers & Callan, 2012), Landers and Armstrong (2017) report that users with positive attitudes towards games expected more from gamification, while those with less positive attitudes expected more from traditional instruction. Nacke and Deterding (2017) note that policy makers have become more aware of motivation and engagement as important components of public policy goals in education and other areas and gamification could fill this niche (Deterding, 2015). Chiu, Kao and Reynolds (2012) provide a meta-analysis of the relative effectiveness of digital game-based learning types for English as a foreign language (FL).

CALL research in the primary school context is limited. Wilson, Hainey and Connolly (2013) note the need for innovative teaching practices in primary education, including CALL. The research literature on GBL in the primary school context is not as comprehensive as in other areas of education. Hainey et al., (2016) provide an overview of GBE at primary level based on studies from 2000 to 2013. They report that GBL has been used with a variety of subjects, with mathematics, science, language and social studies being the most popular areas, and most of the studies used a specially implemented game rather than a commercial off the shelf (COTS) game. They recommend Randomised Controlled Trial (RCT) students to check if GBL is useful and viable. Hainey et al. (2016) note that if a student does not master the basics at primary level, second level becomes more difficult and this is very relevant in the context of Irish. Teachers at second level assume that their students already know the basics of the language and continue teaching from that point. However, many students struggle with the subject and switch off completely from the subject, assuming that it is too difficult for them.

The use of the Irish WordBricks app was always intended as a complement to the work of the teacher in the classroom and never as a fully gamified course. Apart from the reward of creating a grammatically correct sentence, there were no badges awarded in the app. The aim of the app was to enable the learners to enjoy constructing sentences and perhaps foster some intrinsic motivation and let them experience the joy of getting something right in a language in which they often struggle.

WordBricks

WordBricks was developed to enable learners to construct grammatically correct sentences using a variety of words from different part of speech categories. Within the CALL domain, it is a MALL app that draws its inspiration from graphical blocks with different colours and shapes that depend on the category of the word. The WordBricks app (Mozgovoy & Efimov, 2013) uses visual learning techniques and is inspired by other brick-like interfaces used in tools such as Scratch (Resnick et al., 2009) and Ebbels (2007) work with blocks to illustrate grammar points. The aim of the app was to increase interactivity which is one of the shortcomings of traditional grammar book exercises. The WordBricks app was initially designed for adult learners (university students) to learn English and it has been used successfully in this context (Park, Purgina & Mozgovoy, 2016).

The WordBricks (WB) app helps students to construct only grammatically correct sentences in Irish. It is based on Standard Irish. The students can combine different words from part of speech categories (e.g. verb, noun) into sentences. Each part of speech has its own colour and shape, and only shapes (bricks) that correctly fit together will be able to be connected. The app allows students to select words from each category and combine them in the correct order. WordBricks has two modes: example and free form. In example mode, learners have to construct a sentence using a pre-defined set of words. This is useful when a teacher wants to ensure that the learners have mastered a particular construct. In free form mode, learners can choose a set of words from a list and construct their own sentences. The list contains sub-lists of words organised by their part of speech category. For example, the noun sub-list could contain 'ball, house, book, person' while the adjective list could contain 'big, small, tall, thin'. The free form mode allows learners to experiment with different components of a sentence. It is one of the main strengths of WordBricks in that it provides *flexibility* to learners which cannot be provided by a static resource like a book or a closed, predefined set of exercises. Figure 1 shows an example sentence from the WordBricks app.

Figure 1: WordBricks sentence

Irish Learning Apps

Irish is only spoken in Ireland, and there is no utilitarian reason for learning the language (Ó Laoire, 2005). Most students in the Republic of Ireland study Irish for 13 years but their level of language attainment is quite low (Harris, Forde, Archer, Nic Fhearaile, & O’Gorman, 2006). There is an Irish language requirement for some state jobs (e.g. school teacher or civil servant). Some primary school teachers do not enjoy teaching the subject as they are not native speakers. There are several pedagogical challenges with teaching the language (e.g. the disconnect that exists between the written form and the spoken form of the language). There is no commercial motivation to develop interactive resources for Irish as the market is small in international terms. It is also very challenging to develop targeted, pedagogically suitable resources for any language. Ideally, there would be a multidisciplinary team in place to develop such resources – but this is often not the case. Consequently, there are very few interactive resources for teachers and learners. Dalton and Devitt (2016) report on using an online detective game for Irish primary school children with positive results, but there are few other similar resources available to teachers and learners.

The aim of this research was to see if a WordBricks app which helps students construct grammatically correct sentences in Irish could make learning more interesting and engaging for them. Figure 2 shows a sentence from the Irish WordBricks app. It forms the sentence ‘*Tá leabhar ar an mbord*’ (A book is on the table).

Figure 2: Irish WordBricks sentence

Key Research Questions

There were three research questions as part of this research. The first was to investigate if the original WordBricks app adapted for Irish be suitable and usable by the target learner cohort. It would be very beneficial if the original WordBricks infrastructure could be reconfigured to work with Irish because this would enable the quick development of a CALL app for Irish, rather than having to develop an app from scratch. It is not simply a matter of ‘plugging’ in the information about Irish — consideration also had to be given to the profile of the target learners. The research team had to take into account the fact that the original app was developed for Japanese adults learning English and the target learner group for the Irish WordBricks app was young, primary school children learning Irish in a traditional primary school context. If such an app was developed, the second research question related to the pedagogical suitability of the app. There is no point in developing an app that is not tailored to the learning needs of the target learners. The third research question related to the teaching and learning experience of the users. For a variety of reasons, Irish is not considered a Modern Foreign Language (MFL) in the Irish education system, unlike French, German or Spanish. This means that the pedagogical strategies and approaches of teachers of Irish often lag behind those of MFL teachers. There is a lot of emphasis on grammar and memorisation, with less emphasis on learning the language for communicative purposes and simply the joy

of learning a language. Currently, many students do not enjoy learning Irish and this impacts on their attitude towards the language which usually starts off positive (“*It’s our national language*”) move becomes more negative as they progress through the education system (“*Why do we have to learn Irish — it’s useless*”). Could a pedagogically suitable Irish WordBricks app be enjoyable for learners who generally do not enjoy their Irish lessons? Table 1 summarises the three research questions addressed in this paper.

No.	Research Questions
1	Would a WordBricks app developed for English and adapted for Irish be suitable and usable by the target user community?
2	Would the app be pedagogically appropriate?
3	Would the teachers and students enjoy using the app?

Table 1: Research questions

Challenges

There were several challenges to be faced in developing the Irish WordBricks app. The original WordBricks app focussed on English grammar and vocabulary. Irish grammar and English grammar are significantly different and the WordBricks app would have to be adapted to cater for the structure of Irish and use suitable Irish vocabulary. Irish has a different word order than English in that it is Verb-Subject-Object (VSO) language whereas English is a Subject-Verb-Object (OBJ) language. Figure 2 shows an example of a simple sentence in both English and Irish. The sentence in Irish, ‘*Chuaigh mé to dtí an siopa*’ is literally translated as ‘Went I to the shops’. Irish is an orthographically deep language in that there is not a clear connection between the written form and the spoken form of the language. Irish has a long written history and this means that spelling conventions from hundreds of years ago have been maintained (to some extent) even though the spoken form has diverged from that of the original written form. Irish has a relatively regular orthography-pronunciation mapping, but it is not taught explicitly to learners. The learners often try to map their knowledge of English orthography to Irish but this can cause problems. Furthermore, the same written form can be pronounced in three different ways depending on the dialect of the speaker. For example, the word ‘*beidh*’ (to be, future form) can be pronounced as *beg*, *bay* or *bye* depending the dialect. Irish is a morphologically complex language and has features such as lenition and ellipsis. These can occur even in simple constructions. For example, ‘*bord*’ is ‘table’ (pronounced as ‘bored’) and ‘*ar an mbord*’ is ‘on the table’ (pronounced as ‘air on mord’). The fact that initial letter for the word table changes can cause confusion. There is a logical, vocalisation reason for this change but this is not obvious and generally not explained to young learners. The orthography-pronunciation divergence and the complex morphology make it difficult for students to write their own sentences from scratch if they have to spell each individual word. They find this very challenging and do not enjoy this type of task.

There were the pedagogical differences to contend with. There are differences between the learning needs of independent adult university students and young learners in a primary school classroom setting. Most of the education literature talks of pedagogy, but in recent years, research on andragogy and the differences between it and pedagogy has continued to grow. Knowles (1968) notes several key features related to motivation in the adult learning context (andragogy). These include need to know, self-concept, readiness and foundation and

these differ from the primary school context. The adult learners of WordBricks could decide when, where and how they wanted to use the app, but in the primary school setting, it is the teacher who decides these matters. Another issue was in the deployment context — the Japanese adult learners could use their mobile phones to use the app, whereas in the classroom the young learners had no access to mobile phones or tablets. Some primary schools in Ireland are well served with computing resources. Some have laptop trolleys where up to 30 computing devices (e.g. laptops or tables) can be moved easily between classrooms, while other schools have a dedicated computer room. However, many schools do not have access to these types of resources and work with just the classroom laptop which is used by the teacher at the front of the classroom.

METHODOLOGY

Research Design

A key consideration for the app was that it was driven by the pedagogical needs of the teachers and learners. This should be the most important factor in the design of any Computer Assisted Language Learning (CALL) resources. Curriculum alignment is a key factor in CALL normalisation (Bax, 2003; Chambers and Bax (2006). It is also a critical factor in the actual use of CALL resources in the Irish classroom (Ward, 2007). Even if a CALL resource is usable and suitable, if it is not closely aligned with what a teacher is teaching in the classroom, it will not be used. For this reason, the grammatical constructions chosen for the app were decided on in consultation with the teachers and were aligned with the topics they were teaching to their students. The topic selection process involved reviewing the textbooks being used by the teachers and picking key topics. These grammatical constructs selected for the first version of the Irish WordBricks app were chosen based on frequency of usage and relevance. The topics chosen were some of the most common structures in Irish and included possession, doing something and location. These topics often cause problems for learners as their structure in Irish is quite different than their structure in English. For example, '*John has a hat*' is '*Tá hata ag Seán*' (literally: *Is hat with John*). Irish uses the Copula (*tá*) + object (*hata*) + possessive particle (*ag*) + owner structure to state that someone owns something.

The app was not a tutor (Levy, 1997) per se — it did not aim to teach a particular construct as it was assumed that the teacher had already explained the topic to the students. One of the main uses of the app was to reinforce prior learning — students would use the app to check their understanding of particular grammatical constructs. A key motivation for developing the app was to increase students' level of enjoyment with learning Irish and this was a continuing focus of the app development process. For this reason, the brick colours were chosen with young learners in mind and the UI was kept clean and simple so as not to distract the learners.

Participants

The development team in Ireland and Japan developed the Irish WordBricks app which was used by 5 different primary school classes. The school and classes were chosen as they are representative of other teachers and schools in Ireland. There were two cohorts: cohort A was composed of two 5th class primary school students (n = 44, ages 10 – 11) and cohort B was made up of three 3rd class primary school students (n = 75, ages 8 – 9). Cohort A had 7 years of Irish language education, 5 of which included exposure to the written form of the language. Cohort B had 5 years of Irish classes and 3 years of reading and writing in Irish. The motivation behind testing the app with two different cohorts was to see if the app would

be suitable for students with different levels of Irish and also if it was usable and useful for both cohorts.

Procedure

With each cohort, the teacher was given a brief overview of how to use the app and how it worked. To overcome the problem of the students not having access to a tablet or other mobile device, the app was run on an emulator on the class laptop and displayed for all students via an overhead projector. While this removed the chance for each student to use the app at their own pace, it provided an opportunity for the class to see the app and the teacher to use a whole class teaching approach. Each grammar topic had two or more example sentences available to learners. The Irish WordBricks app also has a feature whereby learners can select their own vocabulary from a pre-defined part of speech (POS) list. This enables learners to create their own sentences and to experiment with the grammatical structure being studied. In the classroom setting, the teacher worked through an example for a particular topic. Students were shown the words in the example and asked to write down on a page what they thought was the correct answer. The teacher then invited a student to come up and use the app in front of the other children in the class. For the 'create your own sentence' (free format) feature, students were asked to write down three sentences using the chosen grammatical structure and then several students were selected to come up and create their sentences using the Irish WordBricks app. The primary school timetable has to be tightly managed by teachers and the Irish lessons lasted around 30 minutes. This meant that the deployment of the app had to be maximised by the teacher while at the same time trying to keep all students focussed on the task and learning.

Instruments

In an ideal scenario, both cohorts would have used all six different grammar topics. However, due to logistical constraints, this was not possible. Cohort A worked with five different grammatical constructs over a 5-week period, while Cohort B worked with the first three constructs over a shorter period. Qualitative evaluation was carried out via anonymous student surveys, teacher surveys and observations. Students filled out a questionnaire after each session with the app to ensure their immediate responses were captured. The students were given guidelines about how to fill out the questionnaire after each session. They were told that it was anonymous and that they should answer the questions truthfully. The questionnaire was designed based on Fowler's (1995) principles for survey design. Students were asked about their experience, and not on things they did not know about. Each question asked only one thing and had three possible answers: no, a bit and yes. Due to the age of the students, these were presented to the students using an unhappy face, a 'meh' face and a happy face. All students answered the same questions, which included both closed and open-ended questions. The questionnaire was designed based on ones that had previously been used successfully with similar cohorts of students (Ward, 2007). A sample questionnaire is provided in Appendix A. The results provided here are for both cohorts combined as there were very little differences between their responses. The results presented here are based on self-reporting on the part of the students and this must be borne in mind when reviewing the results. Young people like to give the 'right answer' to questions in a school context and tell adults what they want to hear. However, the students were told that their honest feedback would help to improve the app and that the researchers wanted to know what they *really* thought of the app and that good and bad comments would be very welcome.

It was important to check if the app was *usable* in this context as it differed greatly from the original WordBricks context. Feedback from the teachers and students indicates that it was *usable* and *usable* by them. It was reassuring how quickly the students were able to use the app as they were all familiar with using apps on a mobile phone. Some of them had slight difficulties using the mouse on the laptop as they expected it to have a mobile phone/tablet feel to it, but they overcame this very quickly.

RESULTS

According to the students, the app was easy to use (82%). A small minority (16%) said it was a bit easy to use and 2% said they did not find it easy to use. These results are encouraging as they indicate that the app was indeed usable by the target learner group. Figure 3 shows the responses to this question. This was an important hurdle to clear. It would be inefficient if the app was difficult to use and it would make it unlikely to be used in the future, both from the teacher's and the students' perspective. The teacher would not feel comfortable using it with the students, while the students could become frustrated and not want to use the app.

Figure 3: Did you find the Irish WordBricks app easy to use?

The main purpose of an educational, game-based app is for it to have pedagogical value. Ideally, a mixed methods approach (with quantitative and qualitative evaluations) would be used to measure pedagogical improvement by use of the app. This would involve doing a quasi-experiment, with pre- and post-testing of with learners who used the Irish WordBricks app and compare their performance with that of a control group. However, this type of experiment is problematic in the primary school context and particularly so in the case of minority languages such as Irish. In the primary school context, different classes even in the same school have too many to control for variables. The teachers, their pedagogical approach, the number of students in a class, the mixture of abilities in the class, the number of students with special educational needs and the textbook being used can all vary. Therefore, it is difficult to use another class as a control group. Another option would be to have a control group within a class, but this is also problematic. It would be logistically difficult, especially if the teacher could not separate out the students into a separate learning space. The Hawthorne effect occurs when the behaviour of participants in a study changes due to their awareness of being observed. This could come into play and affect the results, especially if the students are not used to technology in the classroom. By their very nature, minority languages usually have fewer numbers of learners. This means that it is difficult to carry out large scale research of CALL resources for minority languages which can sometimes overcome the issue of lack of access to control groups (Ward, 2018). The majority of the students (73%) reported that they thought the Irish WordBricks app helped them to learn Irish (73%), while 20% said it did a bit and 7% reporting that they think it did not help them. There are self-reported subjective figures but welcome just the same. Learner perception is

important in the learning process and can foster motivation and the responses to this question indicate positive educational perceptions of the app.

Figure 4: Did you think it helped you to learn Irish?

The students were asked if they would like their teacher to use the Irish WordBricks app in class. In the context of this research, this was important. Ideally, each student would have access to a tablet to use the app as and when they wanted, but in this deployment context they could only use the teacher's laptop. The researchers wondered if this limitation would diminish the desirability of the app from the students' point of view. The majority of the students said that they would like the teacher to use the Irish WordBricks app in class (81%), with 14% saying a bit. 5% of the students reported that they would not like their teacher to use the app in class.

Figure 5: Would you like your teacher to use the Irish WordBricks app in class?

As regards the most important question — did they enjoy using the app — the result was an overwhelming yes at 84%. 15% of the users found the app a bit enjoyable and only 1% did not enjoy using the app. The students had many suggestions for improving the app including introducing gaming components such as challenges and a timer. It is interesting to note that many students identified game-like elements as possible improvements to the app. The positive response to the app is probably best summed up by the comment “It was the best Irish app I have ever seen!” (even if there is very limited competition).

Figure 6: Did you enjoy the Irish WordBricks app?

The feedback from the teachers was also positive. They found it beneficial for their students and reported that they seemed interested in using the app. They said that they would like more topics to be added to the app and they would like to continue to use it in the future. This the first time they had used such an app and were pleased with the positive interaction of their students with the WordBricks app.

DISCUSSION

Research Questions

In terms of the research questions, the findings are positive, albeit with some caveats. RQ1 was “Would a WordBricks app developed for English and adapted for Irish be suitable and usable by the target user community?”. The Irish WordBricks app was deployed successfully in a primary school in Ireland and was used without any problems by the young learners. RQ2 looked at the pedagogical appropriateness of the app. The contents of the app were pedagogically appropriate but further research is required to investigate any impacts on learning. This is logistically challenging and perhaps creative ways will be required to carry out this research. The final research question, RQ3, related to enjoyment (“Would the teachers and students enjoy using the app?”). Both teachers and students reported high levels of enjoyment with the app and they looked forward to using the app in the classroom. Table 2 shows a summary of the findings.

No.	Research Questions	Finding
1	Would a WordBricks app developed for English and adapted for Irish be suitable and usable by the target user community?	Yes, the app was suitable and usable by the learners.
2	Would the app be pedagogically appropriate?	Yes, the app was pedagogically appropriate (although further research is required)
3	Would the teachers and students enjoy using the app?	Yes, both teachers and students enjoyed using the app

Table 2: Research questions and findings

In general, the findings were similar across both cohorts. However, Cohort A (the older cohort) would have liked to be able to create more complex sentences. They also suggested more challenges and, as would be expected, were able to complete the activities more quickly than the younger students in Cohort B. There have been relatively few studies of this type as the use of CALL and MALL apps for Irish in primary schools has been very limited. However, the overall findings concur with previous research (Ward, 2007). They demonstrate that when pedagogically suitable and usable Irish CALL resources are developed, there is an appetite and desire for them from both teachers and students.

Limitations

There are several limitations with this project. The number of students is small ($n = 119$) and all the students were male as the research took place in an all-boys school. In Ireland, many older schools in bigger towns and cities are single sex school, so it is not particularly unusual in an Irish context. It would be interesting to replicate this research in an all-girls school and in a mixed school to see if there were any differences between the different learners. The current version of the Irish WordBricks app only covers 6 grammatical topics which is only a small subset of the structures on the Irish curriculum. These topics were chosen in consultation with the teachers and were deemed the most important topics by them. The

young learners were familiar with the topics and did not encounter any great difficulty in constructing sentences.

Recommendations

There are several recommendations arising from this research. A user-centred design approach was adopted at the start of this research. It is very important to work with teachers in deciding the contents of an education app. The contents must be curriculum aligned as otherwise the teachers will not be able to find space in the school timetable. The app must be easy to use with minimal time required for setup and user training. This means that the students can start using the app almost immediately without any time being wasted. Given the time constraints on the daily timetable, the teacher must be able to set up and get the app running with a minimal of fuss. In terms of process, it is beneficial for the teacher to show the students an example of the construct being studied and refreshing the students' knowledge of that construct. This is especially important when the students may have studied the topic several weeks or even months previously. As the classroom is the only exposure that the students (and indeed, the vast majority of students in Ireland) have to Irish, unless the topics are used and refreshed frequently in the classroom, they students are liable to forget the construct. The vocabulary chosen for the Irish WordBricks app was based on frequently occurring words and words selected from the classroom Irish textbooks. However, it transpired that some students were not familiar with some of the words and it was helpful to revise the words with them.

The next recommendation will probably be obvious to most primary school teachers, but may not occur to researchers from outside the primary school context. It is important to check what a student has written before inviting him or her up to construct the sentence in front of the entire class. A student may have written a sentence that is quite personal and grammatically correct but it would not be in the young learner's best interests to construct it in front of the class.

Expect logistical problems. During this research, several of the overhead projectors in the classrooms had bulb problems and were not suitable for use, so a portable projector had to be used. Researchers cannot assume that each class will be able to use the app when scheduled to do so. In the primary school context, there may be unexpected interruptions to plans, new activities may take place or the teacher may be ill. It is important to build contingency plans into this type of research schedule.

A final observation relates to CALL normalisation whereby technology is fully integrated and invisible (Bax, 2003). There are many factors that influence CALL normalisation including logistics, stakeholders' attitudes and knowledge, syllabus integration and training development and support. It is important to consider these from the outset of any CALL research and to interpret the findings in light of where the participants are on the CALL normalisation spectrum. Researchers have to be careful of mistaking teachers' and students' initial enthusiasm and awe for absolute brilliance of the resource under investigation.

CONCLUSION

There are very few CALL resources for Irish and even fewer game-based learning resources for the language. WordBricks has already been used successfully with adults to help them to learn the grammar. The Irish WordBricks app was developed to provide a CALL resource for

common Irish grammar constructs. It was aimed at primary school learners, but could of course be used by learners of all ages. The aim of this research was to investigate if the Irish WordBricks app could make learning Irish more engaging for students. Feedback from both the teachers and the students indicated that it was indeed engaging for them. The teachers also reported that the students looked forward to the Irish WordBricks sessions and that there was a 'buzz' in the classroom when the app was being used. A laptop with an android emulator was used for this research and it would be interesting to explore the use of the Irish WordBricks app using tablets in the classroom. This research indicates that using this type of app was feasible and that there is an appetite for this type of resource in the Irish primary school context.

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