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REALIZING THE POTENTIAL OF MOBILE PHONE TECHNOLOGY FOR LANGUAGE LEARNING

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Abstract

This paper focuses on the exploitation of mobile phone technology for the learning of foreign languages. It begins by considering the obstacles facing the effective use of mobile phone technology for language learning. In doing so, the paper describes four challenges that have to be overcome for mobile phone technology to become an effective pedagogical tool. Specifically: Intrusiveness, Cost, Practical technological constraints and Pedagogical methodologies. Having defined the issues that need to be addressed, the paper then proceeds to describe how these challenges have been met in the design of MobLang, an EU funded Lifelong Learning project.

MOBILE LANGUAGE LEARNING

For as long as people have been learning, there has been an interest in freeing the process from the constraints of time and place. Clay tablets, scrolls, then much later printed books where the first technologies employed to meet this challenge.

Language learning is arguably one of the most difficult areas for mobile learning to accommodate, most especially when the spoken language is involved. In modern times, the earliest application of audio recording technology to support independent language learning were wax cylinders produced by Linguaphone in 1901. These gave way to phonograph records in the 1920's, then again by magnetic tape in the 1960's and eventually by digital technology in the 1980's.

The advent of laptop computers in the 1990's brought mobile computing, and thus mobile language learning, one step closer. Truly portable learning applications, however, had to wait a decade for the introduction of the Portable Digital Assistant (PDA) and the i-Pod. The introduction of these devices gave rise to what has come to be called Mobile Assisted Language Learning (MALL).

The PDA, however, was a businessman's tool and it never really penetrated academia, so its application to mobile learning of any kind was very limited. The i-pod, and other mp3 media players it spawned, have fared better. Podcasting has proven a useful out-of-class pedagogical adjunct in language learning, though it must be said that the use of podcasting for language learning remains very much more the exception than the rule.

Mobile Phone Applications

Compared to the PDA, and to even the i-pod and other similar devices, mobile phones have had far greater market penetration. It is estimated that by the start of 2011 there were 4.2 billion mobile phones in use worldwide (Brightside of the News). That's nearly four times the number of personal computers. The actual number of mobile phone owners is put at 3.7 billion, i.e., about 55% of the global population.

As mobile phone features have increased, while their cost decreased, attention has increasingly focused on them as an ultra-portable language learning tool. Above all, what has attracted interest in the use of mobile phones as learning devices is their potential to support anywhere, anytime, access.

The first attempts to use mobile phones for language learning go back to 2001 (Houser, Thornton, Yokoi & Yasuda). Given the state of the technology at the time, this was necessarily restricted to the exploitation of SMS, i.e., text messaging. Since then a number of researchers have explored the use of mobile phones in language learning, again mostly involving SMS (Andrews, R. 2003; Horstmanshof, L. 2004; Kiernan, P.J., & Aizawa, K. 2004; Levy, M., & Kennedy, C. 2005; Kennedy, C., & Levy, M. 2008; Mellow, P. 2005; Stockwell, G. 2007; Stockwell, G. 2010; Thornton, P., & Houser, C. 2005).

OBSTACLE TO MOBILE PHONE USAGE

Those attempting to exploit the portability of mobile phones for language learning have consistently encountered a number of obstacles.

Intrusiveness

Firstly, there is a psychological factor. Even though students typically carry their phones with them all the time and are prolific users of SMS, they have proven rather intolerant of pedagogical messages invading what they regard as their private space. For many students, even one such message per day tested the limits of tolerance (Kennedy, C., & Levy, M. 2008).

Above all, "pushed" resources is what has turned students away from the pedagogical use of mobile phones. For practical and economic reasons, most SMS language applications have been based on messages automatically sent out in bulk from a central server at fixed intervals. Even when language learners agreed in advance upon the frequency and timing of these messages, their arrival quickly wore out its welcome. Once the pedagogical messages were read, retrieving them from the dozens of personal messages in storage proved to be a real nuisance. Personal messages often had to be deleted in order for the pedagogical material to be retained. Where storage space was really limited, older pedagogical messages had to deleted to make room for new ones.

The lesson here is clear, the pedagogical exploitation of mobile phones must not use pushed technology. However, the alternative "pulled" technology is not without its problems either. Even with simple SMS, when originating from a central server, the requesting of resources requires a more sophisticated response system. Unless the only thing that can be downloaded is the message of the day, a mechanism for determining what is wanted and delivering it needs to be put in place. Anyone who has experienced the frustration of having to deal with "push 1 for this", "push 2 for that" menu options will instantly recognize the pitfalls of pulling pedagogical resources from an automated phone system.

Costs

A second inhibiting factor is cost. As long as only text messaging has been involved and SMS charges were covered by flat rate contracts, students have not complained. However, the prospect of making students pay for telephone services has been a matter of concern and hesitation (Kennedy, C., & Levy, M. 2008). In contrast to the use of mobile phones for personal usage, where the question of cost is demonstrably not an issue, it cannot be taken for granted that students will willingly accept to pay phone charges incurred by the use of pedagogical applications.

Pulling pedagogical resources, in particular, can carry with it substantial expenses. Firstly, there is an additional user cost involved in contacting the distributing source. And if media other than text is involved, significant transmission charges as well. Smart phones can now connect to the Internet and, through a web interface, allow users to browse for the resources they want. But

again, phone-based Internet connections come at a price that many learners may be unable, or at least unwilling, to pay. So, too, mobile phones which offer Internet connectivity are among the most costly. Also outside of large metropolitan areas, phone-based Internet access may simply not be available.

Practical Technological Constraints

Very practical constraints have also dogged the pedagogical exploitation of mobile phones.

Mobile phones are small. That's what makes them so portable. By definition, they must have small screens and keyboards. The typical 240 x 260 pixel phone screen is Lilliputian compared to that of a computer monitor. However, even more than small screen size, it is the keyboard of mobile phones that constitute the greatest obstacle to language learning applications.

Unlike the personal use of SMS, where spelling is famously ignored and cryptic abbreviations abound, when used for language learning purposes text inputting has to be precise. Given the typical, multi-click, text input method used on mobile phones, this is an intrinsically laborious process, one which distracts from learning objectives. Even phones which, exceptionally, use a regular qwerty keyboard are of no real avail. Like any other text-input method, in order to be used for language learning purposes, keys have to be remapped to allow foreign characters to be typed. Remapping, of course, does not change what is physically imprinted on the keys, so some way has to be found to indicate which keys type which foreign characters. One way around keyboard remapping problems is to use an on-screen virtual keyboard. This works fine on computer monitors, but vies for critically limited space on a mobile phone screen. In reality, since the vast majority of studies has involved English as a foreign language, no attention has been paid to keyboard inputting problems. All languages involved have used a roman alphabet and, where they existed, diacritics have simply been ignored.

Ironically, for an oral communication device, until recently mobile phones have not supported audio playback or recording. So, too, mobile phones have had very restricted programmability and limited memory. This has markedly improved in most recent models, with more sophisticated operating systems and the advent of micro SD memory cards capable of storing Gigabytes of data. There remains nonetheless a critical lack of standardization and a resulting high degree of incompatibility between the various platforms. Programming for a wide target audience thus remains problematic.

Theoretical & Pedagogical Foundations

Lastly, the experimental use of mobile phones for language learning has suffered from serious pedagogical limitations. The application to date of mobile phone technology to language learning has been basically atheoretical. Though never made explicit, the methods used have typically followed behaviorist principles of repetition and rote memorization. Almost without exception, the programs have been restricted to the learning of isolated words and grammar rules, with no context and no communicative activity, no feedback on performance, no visuals, no audio. Largely because of previous technological constraints, exposure to language has also been essentially limited to text. Whether pushed or pulled, SMS just does not lend itself well to online language usage activities or feedback on performance. In the rare case where mobile phone programs included language application activities, these where done in class on the basis of vocabulary or other information that was transmitted over the phone (Kennedy & Levy 2008).

The Way Forward

On the basis of past experience, it is clear that if mobile phone technology is to provide an effective language learning platform, it will need to meet the following criteria:

- Its use cannot be intrusive.
- Its cost must be minimal.
- Its practical technological constraints must be reduced to a minimum.
- Its learning programs must be based on pedagogical methodologies grounded in second language acquisition research.

These were the primary considerations behind the design of the MobLang project.

THE MOBLANG PROJECT

MobLang is an EU funded project whose mission is to provide majority language speakers with basic communicative competency in languages that have minority status in their country: Basque in Spain, Irish in Northern Ireland, Albanian and Turkish in Greece, Turkish in the southern part of Cyprus and Greek in the Turkish occupied north. The MobLang project set out to fulfill its mission through the use of mobile phone technology. The design of MobLang addresses the challenges of making effective use of mobile phone technology in a number of innovative technical and pedagogical ways.

Intrusiveness

All MobLang resources are immediately available to learners through an on-screen menu system. Users browse the system as they would on a computer. They are entirely free to choose what they want to learn, when they want to learn it. This is genuinely anywhere, anytime learning.

Cost

All MobLang programs are stored locally on a micro SD memory card. Since the smallest such cards can hold 2GB of data, and an entire MobLang package requires less than 100MB, most phones with a memory card installed should have no difficulty accommodating the program. Even if a memory card has to be purchased, the cost to users would typically be less than $10. Lesson content is provided for free as part of the project. This can be downloaded via an Internet link to any computer and transferred to an SD card either directly or through a USB connection to a phone.

Since the program is installed on a memory card, there are never any phone or data transmission charges to access it. Moreover, because the SD card operates independently of any telephone connections, MobLang can even run on a dead mobile phone, i.e., one without a SIM card. It can't get any cheaper than this.

Practical Technical Constraints

Although small screen size is a sine qua non of mobile phone usage, the full color and high resolution of most screens is now really quite good. They are even capable of displaying crisp video images. Used judiciously, the quality of these screens can largely overcome their size constraints.

On the other hand, mobile phone keyboards, especially when foreign language scripts are involved, remain a major obstacle to text input in language learning applications. MobLang lessons, therefore, simply do not use text input. They make extensive use of text for presentation of materials and for activity prompts, but learners never type in text responses. They can, however, manipulate on-screen words by rearranging them to form responses.

Accessibility

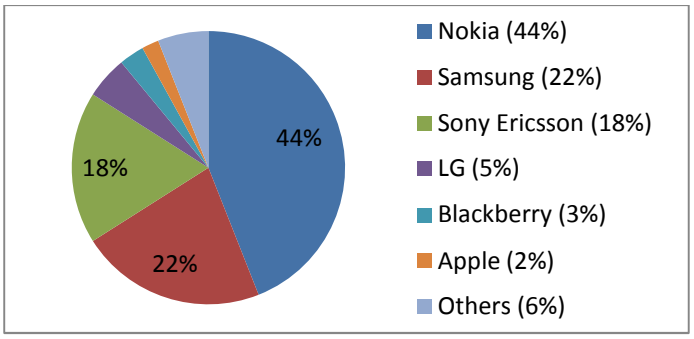
These days, programmers are able to squeeze an amazing amount of functionality out of mobile phone processors, at least those found in the most recent phones. However, the most advanced phones are also the most expensive and thus have the smallest market penetration.

While, understandably, programmers have a preference for top-end "smart phones" like the i-phone and its android competitors, the need for MobLang to reach

as large a target audience as possible dictated that our programming platform be based on mass market mobile phones.

According to a survey taken among the targeted users of MobLang, between them three brands accounted for 84% of all mobile phones in use (Table 1).

Table 1: Mobile Phone Brands in Use



These results correspond fairly closely to the worldwide market share of mass market phones, which is put at about 82% of the installed base (Brightside of the News). Approximately half of these phones run Java, provide a multimedia player, and support a micro SD memory card, i.e. 41% of all mobile phones worldwide. Among the targeted MobLang users, the number of phones with these characteristics is estimated to be about 65%.

Though despairingly referred to as "dumb phones", in the hands of a smart programmer, such Java-enabled, multimedia, memory enhanced devices are capable of a great deal more functionality than is generally recognized.

Given the MobLang target audience, the choice of mobile phone platform fairly well imposed itself. Although our pilot testing is restricted to Nokia (6303i), MobLang lessons have the potential to run on any Java-enabled phone equipped with a mico-SD memory card and capable of audio recording.

THEORETICAL & PEDAGOGICAL FOUNDATIONS

Unlike nearly all previous uses of mobile phone technology for language learning, the MobLang program is not part of an institutional curriculum. Only in one language (Irish), where it is being used with school children, is it even indirectly associated with an academic environment. Sound methodology grounded in second language acquisition research is thus an absolute necessity for its effectiveness. It

cannot rely on outside teachers and classrooms to compensate for pedagogical shortcomings.

Notional/Functional Syllabus

It needs to be emphasized that our target audience is not learning Irish, Basque, Turkish, etc. in the traditional sense of being exposed to formal lessons, grammar explanations, reading texts and doing writing exercises. The pedagogical intent of MobLang is to provide sufficient oral communicative competence to allow majority language speakers to socially interact with minority language speakers in the minority language. The syllabus is thus notional/functional in nature with emphasis on oral comprehension and production. The written language serves essentially to provide visual support to aid memory retention and recall.

Lexical Approach

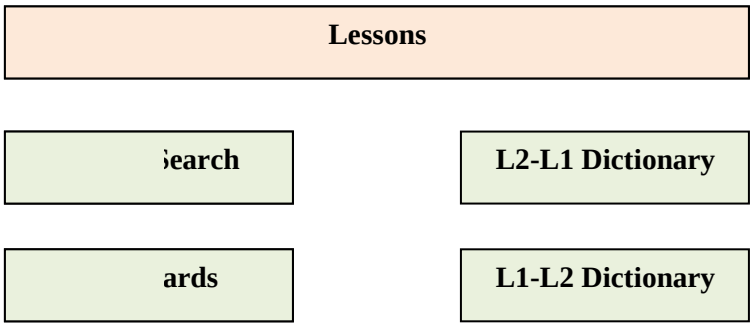
A large body of research on vocabulary acquisition (Cowie, A. 1998; Ellis, N. 2003; Lewis, M. 1993, 1997, 2000; Meunier F. & Granger, S. (Eds.) 2008; Nattinger, J. & DeCarrico, J. 1992; Peters 1983; Pawley & Syder 1983; Schonell, Meddleton & Shaw 1956; Wray, A. 2000) concurs on the central role of lexical chunks in linguistic competence. It is claimed (Altenberg, B. 1998) that as much as 80% of native speaker utterances consist of collocations and formulaic expressions. Moreover, a great deal of the grammatical constructions of a language are embodied in these lexical strings. For these reasons, the pedagogy underlying MobLang lessons is based on lexical phrases from which learners can acquire basic underlying grammatical patterns.

MOBLANG LESSONS

In collaboration with Anspear (http://www.anspear.com), a software programming company specializing in pedagogical applications for Java-enabled mobile phones, a common lesson core was developed for application to the various L1/L2 combinations.

The MobLang program is accessed from a graphical interface Applications menu which comprises a main Lessons module plus four ancillary modules: Lesson Search, Flashcards, and two Dictionaries (L2-L1 and L1-L2). Lesson Search gives access to all lesson materials via an alphabetical listing.

Figure 1: MobLang Graphical Interface



Flashcards allow users to practice simple bi-directional L1/L2 word and phrase correspondences.

Figure 2: MobLang Dictionary Interface

Greek-Turkish **Turkish- Greek**

Lesson Structure

The heart of the MobLang program are the thematic lessons. MobLang lessons are organized into seven thematic categories, as follows: 1) Getting Started; 2) Greetings; 3) Time & Weather; 4) Food & Drink; 5) Direction & Location; 6) Shopping; 7) Personal Relations.

Thematic lessons are accessible from drop-down horizontal "carousel" menu options, each of which gives access to its own set of sub-menus. Because it scrolls horizontally, the carousel menu structure can accommodate any number of lessons while occupying only about a third of the screen space.

Figure 3: MobLang Greek-Turkish Lesson Themes

Getting Started **Greetings** **Time & Weather** **Food & Drink**

The Getting Started module consists of three sub-components: the Alphabet, Numbers, and Calendar (Seasons, Months, Days). Each of the other thematic categories contain a Phrase component consisting of about 25 formulaic expressions. These are combined to form about a dozen mini-dialogues (2-3 phrases) in the Dialogue component of the thematic category.

Figure 4: Phrase and Dialog Lessons

Phrase Lesson **Dialogue Lesson**

In all, MobLang lessons comprise a total of about 150 phrases and 70 dialogues in each of the five L1/L2 language pairs. The word level constituents of these phrases provide the contents of the bi-lingual Dictionary modules.

Tutorial Exercises

The Phrase and Dialog components of each theme give access to another carousel sub-menu structure, which consists of four tutorial constituents: 1) Vocabulary, 2) Listening, 3) Speaking, 4) Reading & Writing.

Figure 5: Phrase and Dialog Component Submenu

Vocabulary **Listening** **Speaking** **Reading & Writing**

The Vocabulary items present L1/L2 correspondences with accompanying audio recordings and, where appropriate, graphics images. The Listening, Speaking, and Reading & Writing components provide a variety of language exercises that foster active (L1 → L2) and receptive (L2 → L1) activities designed to support memory retrieval and vocabulary acquisition. These exercises utilize text, audio, and graphics combined in a half-dozen formats (Table 2).

Table 2: MobLang Activity Types

PHRASES
Listening
Hear L2 / Select multiple-choice L1 text equivalent
Hear L2 / Unscramble L2 text equivalent
Speaking
See image / Record L2 word
See L1 text / Record L2 equivalent
Reading & Writing
See L1 text / Select multiple-choice L2 text equivalent
See L1 text / Unscramble L2 text equivalent
DIALOGUES
Listening

Hear L2 dialogue prompt / Unscramble L2 text response
Speaking
See L2 text dialogue prompt / Record L2 text response
Hear L2 text dialogue prompt / Record L2 text response
Reading & Writing
See L2 text dialogue prompt / Unscramble L2 text equivalent

Record Keeping

Within exercise sets, items are presented in random order. Moreover, MobLang language exercises operate on the basis of the Leitner system of spaced repetition. In effect this means that, when learners retake an exercise, items that have previously been answered incorrectly get presented more frequently than items that have been answered correctly.

In addition, MobLang lessons keep track of the following user parameters:

- lessons viewed
- time of day used
- duration of learning sessions
- lesson scores
- learner evaluations

This data is stored on the user's telephone memory card and is retrievable. At present, data harvesting has to be done manually, but the potential exists to collect user data remotely and store it on a central server for analysis (or student monitoring).

CONCLUSION

The long history of freeing learning from the constraints of time and place leads naturally today to efforts to exploit mobile phone technology, with its promise of anytime, anywhere access. Early attempts to use mobile phones for foreign language learning, however, suffered from technological constraints as well as serious pedagogical shortcomings. The advent of programmable phones equipped with memory cards and capable of graphics and video display as well as audio playback and recording, now provide a platform that can support language learning activities hitherto reserved for computer applications. And this can be done using relatively inexpensive mass market phones without incurring telephone, Internet or data transmission charges. The only remaining practical obstacle is that of the text inputting. Notwithstanding, there are ways around text inputting and, in any event, the use of text for the presentation of learning materials is not at all problematic.

Pedagogically, at least at elementary levels where emphasis can be placed on a notional/functional syllabus and the acquisition of formulaic vocabulary, mobile phone technology can be effectively exploited for language learning. The programming capacity of modern mobile phones can provide a rich mix of text, audio, graphics and even video to support language exercises designed to foster receptive and productive memory retention that targets basic communicative competence. It can also provide learners with feedback on performance, support record keeping and algorithms that make intelligent use of spaced repetition of exercises. In sum, mobile phone technology has now reached a point where, guided by sound pedagogy, it can realize the promise of ultra-portable language learning.

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