Language & Technology

Computer Assisted Language Learning

Edited by:
Dara Tafazoli & Sebastian C. Chirimbu

Foreword by: Mark Warschauer

In The Name Of God

LANGUAGE& TECHNOLOGY

Computer Assisted Language Learning

Edited By:
Dara Tafazoli
Sebastian C. Chirimbu

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Section I

Theoretical Background of Technology

Chapter 1
Introduction: Applications of Technology to Language Classes

Dara Tafazoli& Sebastian C. Chirimbu
University of Applied Science & Technology, Iran
Spiru Haret University, Romania

1. Introduction

Using technology in pedagogy is important for both teachers and students. Technology can handle a range of activities and carry out programmed functions in different situations. However, technologies have not yet gotten to the point where it can make real difference in educational environments. This short introduction aims to have a brief review on different tools and devices maybe it is meant in a real class.

Perhaps the most important aspect of applying different media in language classes is to gain computer competence. Most of the students in this study have had little or no experience with computers; some even have technophobia. But we can use more user-friendly technologies in classes.

One of the major advantages of using media in education is that this field is highly eclectic. The advantages of application of technology in language learning classes, or what is called Computer Assisted Language Learning (CALL), is mentioned clearly by several scholars in Leech and Candlin (1986):

1. Computers can cope with real needs of individuals. (Phillips, 1984)
2. They increase motivation, mainly in non self-motivated students. (Windeatt, 1984)
3. Computers are more and more familiar with everyday even for young students and contribute to break the walls between the classroom and the outside world. (Phillips, 1984)
4. There is an improvement of security. (Alderson, 1984)

2. Brief History of CALL

From the middle of thenineteen centuries to date, some learning theories have been emerged. The rise of Behaviorism, inspired by the ideas of Skinner (1957), has had a significant influence on language learning. Behaviorists believe that utterances and speeches served as conditioned and stimulus response; and learning is a matter of habit formation. Thus, they consider reinforcements and associations as the main factors in language acquisition. The applications of CALL from 1960 to 1970 were greatly influenced by Behaviorism. In that era, most of the CALL programs were usually based on grammar and vocabulary tutorials and drill-and-practice programs which followed the computer-as-tutor model (Warschauer, 1996; Warschauer & Healey, 1998). According to the principles of Behaviorism we can guess that these programs were designed to provide immediate feedback on the learners` accuracy. Actually, their emphasis was on explicit grammar instruction.

Cognitive psychologists focused on the significance of meaning, knowing and understanding which constructs internal representations. The second phase of CALL development emerged along with cognitive constructivist views of learning in the late 1970s and early 1980s. It focused on the idea that CALL programs should concentrate on using languages more than the language itself. In that period, the first principles of communicative approach to language learning were manifested. The focus on forms shifted to focus on form by computer-base learning. Moreover, it encouraged students to produce original utterances rather than manipulating prefabricated ones.

Vygotsky (1930)put more emphasis on social context of learning, he shared many of Piaget's assumptions about learning. He believed that social interaction plays a fundamental role in cognitive development. He claimed that everything is learned on two levels: (1) through having interactions with others which will (2) integrate into the individual's mental map. In Vygotsky's opinions, the social cultural environment gives people the cognitive tools needed for learning. This attitude towards learner's interaction developed CALL programs for meaningful interaction in authentic discourses.

3. Technology-based Tools in Classrooms

3.1. Podcasts & RAs

One of the first tools in language classes is audio files on CDs, flash memories and other devices. Graham Davies (2005) claims that the single piece of technology that has mostly affected language learning is the cassette recorder. After the above mentioned files, today other audio files such as podcasts are available. Podcast or audio blogs are downloadable broadcasts with Really Simple Syndication (RSS) feeds which allow listeners to subscribe to them (Salameh, 2011). It is a new way in teaching languages and provides better materials (McNicol, 2004; Chartrand & Pellowe, 2007; Kargozari & Tafazoli, 2012). The major difference oftraditional Internet audio or radio broadcasts is that podcasts can be listened when and where the user prefers. They are also automatically delivered to subscribers (Diem, 2005; Sloan, 2005).

***Fig. 1**. Taxonomy of uses of podcasting for language learning (Rosell-Aguilar, 2007:477)*

Real Audio (RA) is another audio file that my help us in language classes. Nunan (1993) believes that allowing students to choose the information they will listen to or watch is inherently motivating. Tuzi (1998) in a study mentioned that "RA sound clips are intrinsically motivating as the materials themselves are of interest to the students". He also claimed that RA has some benefits to students such as:

> …listening to information that interests them, listening to sound clips over and over again, listening to a variety of voices which strengthens listening ability, being encouraged to become more independent learners, listening to spontaneous speech, and reading and listening at the same time. (Tuzi, 1998)

3.2. Video clips & Vodcasts

Using films in classes has been a popular method of teaching for many years. Some research papers reported the positive effects of language learning with video clips (McGreal, 2004). Naturally, watching full-length films is not always the best approach (Heffernan, 2005); rather, way to spend classroom time with our students but it is possible to bring some movies and trailers into classrooms.

Vodcast is a combination of "vod" and "cast". Vod is an acronym for "video on demand" and "cast" stands for broadcasting (Kargozari & Tafazoli, 2011). Vodcasts are posted on the internet and can be played back on mobiles, personal computers, or laptops. Vodcast, that is called video podcast, has one advantage over podcasts and it is its ability to connect visuals to audios. Vodcasts as well as podcasts have potential to support learning in a range of settings and across multiple disciplines. Kargozari & Tafazoli (2011) in a study claimed that the use of vodcasts is a valuable means of instruction. Students had access to the material of instruction whenever and wherever they like.

3.3. Mobile

Cell phones are one of the most wide spread and available devices for education which are almost available for every university student. Most of them have different functions like accessing to the Internet, working as mp3/mp4 players, digital camera and video recorder.

Many of them are also Flash-enabled and/or Java-enabled and can run multimedia contents including audio and video. Among different disciplines which took advantage of mobiles we can call the field of language learning. Today Mobile Assisted Language Learning (MALL) is moving into the field of language acquisition and is used as a device to improve different aspects of language learners' proficiency (Kukulska-Hulme & Shield, 2007). Mobile devices have the potential of moving language learning from predominantly classroom–based learning contexts into contexts that are free from time and space and in which learning is to a larger extent defined by learners' participation, engagement and context awareness (Levy & Kennedy, 2005). Mobile devices such as the mobile phone enable the learners to learn from context and in context, gathering information from the environment and requiring support and assistance when this is needed. This kind of appropriate support can be seen as a form of scaffolding (Naismith, et. al., 2004). Song & Fox (2008) found that some learners were capable of using a mobile device to support and extend their learning in self-directed ways. Michelsen (2008) suggested a self-directed and learner-centered design of mobile learning which enables second language learners to practice language by their own pace. Stockwell (2007) has explored vocabulary learning on a mobile device. They found that mobile phones facilitated vocabulary learning among their subjects. Several studies tried to integrate cell phones into language learning, for example using text messages to teach English language (Qing Li, 2008; Thornton & Houser, 2003; Kargozari & Tafazoli, 2011).

3.4. Internet & Web 2.0

The Internet has become a very powerful tool in our daily life. Using email, weblog, social networks, etc. has become a vital part of modern life. This amazing invention becomes popular in education, too. With the widespread use of the Internet, many online tools are increasingly available for using in educational and non-educational settings. In view of the need for CALL researchers and practitioners to find, choose, use and evaluate educational tools for further development and implementation of CALL, it should be fruitful to introduce new and useful tools that can be used for language learning and teaching.

Bicknell (1999) stated that using the Internet and its applications act as a motivational apparatus which gives students the chance to use all four language skills. The Internet also allows students to connect with each other in ways they normally would not be able to do so (Haffernan, 2005). Web-based activities such as message boards, chat rooms, email, and discussion groups provide learners with a healthy forum to communicate. Healy (2000) noted that the above activities give learners a "direct and immediate communication between peers while using genuine language". Psychologically, Warschauer (1997) noted greater participation by so-called "shy" students when using the Internet as a language-learning tool.

3.4.1. Internet Communication Tools

Communication tools enable students and teachers to make audio and video calls over the Internet. By these tools, it is necessary for users to have a microphone and audio capabilities. Some scholars used the Internet communication tools in their education (Davis, 2006; Mirtschin, 2008; Smith, 2009; Stephenson, 2009; Waters, 2008; Eaton, 2010). One of the main features of these tools is cross-cultural exchanges with other students in different countries. Eaton (2010) believes that Skype, a proprietary Voice over IP service and software application, can be used to provide a variety of authentic learning experience to students.

3.4.2. Emails

Email as one of the Internet-based devices, "the mother of all the Internet applications" (Warschauer, Shetzer, & Meloni, 2000), has been under investigation by so many scholars who find it a useful device in education (Belisle, 1996; Liao, 1999; Fox, 1998; Trokeloshvili & Jost, 1997; Muehleisen, 1997). Wilkinson (1996) tries to encourage other teachers to introduce e-mail into their classrooms by giving the most basic guidelines for teachers and students, together with the URLs of places to find teacher partners to set up a successful e-mail connection. Nagel (1999) in a study deals with more advanced issues connected with the use of e-mail in teaching, and specifically with how to be most effective and to get optimal results in the use of e-mail as an instructional tool. Oxford (1997) believes that emails can be a medium of real communication in the target language, including composing and exchanging messages with other students in the classroom or around the world. According to Gonglewski, Meloni & Brant (2001) emailing has so many benefits in pedagogy such as:

> …extends language learning time and place, provides a context for real-world communication and authentic interaction expands topics beyond classroom-based ones, promotes student-centered language learning, encourages equal opportunity participation, and connects speakers quickly and cheaply.

3.4.3. Concordancing

Hasselgard (2001) defined that corpora, plural form of 'corpus', refer to electronic authentic language databases that can be available via internet or as software installed on desktops. A concordance is a list of the occurrences of either a particular word, or part of a word or a combination of words in context and it is drawn from a text corpus, which is presented in context. A corpus is a large body of text often in electronic format. (Baker, 1995; Francis, 1993; Johansson, 1995; Leech, 1991; St.John, 2001) Nowadays, concordancing is a tool that has been used by teachers, linguists and researchers in different disciplines as it provides authentic context. There are some free online resources on the Internet such as British National Corpus (BNC), Virtual Language Center (VLC), and the International Corpus of English (ICE). Moreover, a study of Gaskel and Cobb (2004) shows that learners can also use concordance feedback for writing errors.

3.4.4. Weblogs

Godwin-Jones (2006) describes weblogs as "one, large, loosely interwoven net of information, as blog entries are linked, referenced, and debated". Weblog is another useful device that has some features such as interactivity, collaboration and achievability. The number of educational blogs soars in recent years. Some papers are published and presented about the potentiality of weblogs in education (Williams & Jacobs, 2004; Kadjer & Bull, 2004; Blood, 2002; Godwin-Jones, 2006; Oravec, 2002; Martindale & Wiley, 2005; Murray & Hourigan, 2006).

3.4.5. Word Clouds

"Wordle" is a kind of data visualization tool. Barret (2010) defines data visualization tools as devices which are used for representing information in the form of charts, maps, tag clouds, animation or any graphical means that make content easier to understand. Friendly (2008) mentioned that data visualization serves as a way to communicate information clearly and effectively through visual representation. These tools can help make the understanding of complex concepts easier because they provide data in multi aspects incorporating visual,

textual animated input and etc. Wordle.net is a useful web 2.0 tool for English for foreign or second language (EFL/ ESL) classes which enables teachers and students to provide word clouds for language classrooms. Tafazoli (2012a) used some techniques for teaching different language skills and components in which teachers benefit from and use them in their classes.

3.5. Video Games

Today, playing video games seems to be a detachable part of every child's life. Although there is a tendency towards using new technology in language classes, there is a less tendency towards video games. Some teachers believe that video games are time consuming and they are not very efficient tools.

Game-Based Learning (GBL) refers to different kinds of software applications that use games for learning or educational purposes. In recent years, both in potential of computer game as learning and teaching tools and in research into their use, there has been interesting interest. So many studies supported the applications of video games in language classes (Wolfe & Crookall, 1998; Reiber, 1996; Tafazoli, 2012b).

Integrating game-based learning into more coherent view of learning relies upon two factors: (a) preparation of learners to adapt to a new learning tool, and (b) institutional support. Oblinger (2004)says "Games also offer advantages in terms of motivation. GBL has this ability to integrate different cognitive tools, such as discussion forums, bulletin boards and concept mapping software". Whitton (2007) stated that "games researchers tend to be highly motivated to play games themselves, and do not consider those individuals for whom game playing is not motivating, or indeed is actually demotivating".

4. Conclusion

To sum up, we would like to build upon Warschauer and Whittaker (1997) to conclude with some general remarks about successful planning and implementing technology in EFL/ESL classes. They stated that teachers should carefully consider their goals, since little is gained by adding random on-line activities into the classroom. Clarifying course goals acts as an important first step toward the successful use of technology in classrooms. The next vital aspect of the technology-based instruction is integration, and the teacher should think about how to integrate technology-based activities into the syllabus. Also, the teacher should be aware of all the complexities of using technology in learning environment, such as cultural, infrastructural, structural, etc. difficulties.

We have to be careful that computers can not change the role of teachers, but they are used to support and assist teachers and learners in different situations. Technology offers learners opportunities for much more valuable communicative interaction in the target language than what was ever possible in the traditional language classes.

We would urge language teachers to make use of technology in their language classrooms. Having such projects are a good way of motivating students to use technology outside the classroom and to make learning a part of their daily lives. Although it is to some extent impossible to present all technology tools and devices in a paper, this paper has presented a range of projects, papers and studies; while it would probably not be desirable or even possible

2.3 Compilation: The didactic component

The second layer of SPACE consists of texts that represent derivations from the first layer (section 2.2). These derivations are routinely published in multi-disciplinary science journals like the New Scientist but the cost of addressing a general-interest academic readership is that these texts are popularized summaries and journalistic recreations of the original research. This is the prime characteristic of our corpus that makes it especially useful for the study and practice of academic writing. If the linguistic basics of argumentation at different levels of abstraction can be laid open, the students can make conscious use of these principles.

Thus, a wide spectrum of linguistic features that are interesting and helpful for learners can be illustrated on the basis of this fact alone: if a text belongs to the text type of an academic text then this text will have:

a) markers of propensity (the commitment of the author(s) to the validity of their results and findings (examples: modal verbs, modal auxiliaries, hedge expressions, see Haase, 2011 in Schmied (ed.) 2011)

b) stylistic devices like amplifiers (examples: *completely, absolutely*) and boosters (examples: *very, highly, immensely*)

c) high lexical specialization (cf. table 2)

d) linguistic markers of causality (causatives, resultatives, conjunctions, use of tense) (see Haase 2006)

The lexical specialization which is the basis for the stud described here is illustrated in two parallel examples in table 2:

Code	Source	Words	Title
0052PN	PNAS	4963	*Feeding acetyl-L-carnitine and lipoic acid to old rats significantly improves metabolic function while decreasing oxidative stress*
0052NS	New Scientist	137	*Pep pills for old age*

***Table 2**. Two parallel titles in their academic (PNAS) and popular-academic (NS) version*

As can be seen, the academic title uses specialized terminology to express an identical fact in comparison to the popular title. There are multiple mappings at work:

The New Scientist mentions *old age*, the original is more specific (*old rats*)

The New Scientist compresses *acetyl-L-carnitine and lipoic acid* and the *feeding* of it into pills.

In the New Scientist the *improvement* of *metabolic function* becomes the *pep* in *pep pills.*

Thus, the popular version in this case is an almost 1:1 transfer of the original.

It has become clear to us that to teach this difference to learners facilitates their access to academic texts and helps improve their skills in meeting the standards of a text type. Further, it gave rise to ideas to formalize or at least describe this process of transfer automatically. It led to the development of the ComplexAna tool.

3. ComplexAna

3.1 Development and rationale

If a learner or generally speaking a human analyst is faced with the task of describing what the process of transfer mentioned above characterizes, the answer would probably be that words for highly specific objects and events are moved down a scale of lexical specialization to a

point when a common semantic core is achieved. This core may not be located at base-level categories (cf. Evans & Green 2006:248) (which would be appropriate perhaps for a juvenile readership) but neither at a level that requires expert knowledge in the field. This can be illustrated with the terms taken from two parallel texts (corpus codes 0007AX and 0007NS) in table 3. The table further shows degrees of causality by introducing a notion of vagueness into the academic argumentation.

	academic text 0007AX	popular academic text 0007NS
markers of specialization	*conjectures, compactification, coalescence, planetesimals, angular, mesoscopic, gauge field, accretion, radial drag*	*dead stars, cloud of gas, hot star, proto-planetary disc, rogue comets*
markers of vagueness	*suggest X may have, should detect Rc, deviations are weak, may be turbulent*	*it may be hard, can be slow, they probably rebound, could charge up*

Table 3. *Semantic depth in two parallel examples*

If we therefore assume that the semantic depth can be seen as a marker of the argumentative prowess in an academic text then we can use this to systematize this as a lexico-semantic function and use it in profiling texts for learners automatically. We can do this for two reasons. First, it can help compare texts and measure their difficulty and second, to obtain learner data from recognition tests to match and correlate them with the words that are impressionistically felt to be of high specialization. In an additional step a given text can then be re-phrased by the learner who consciously employs the process of transfer. An added advantage is that the transfer may be guided in both directions, upward to higher specialization (greater semantic depth) and downward to lower specialization (less semantic depth).

In order to make this feasible, a very solid and extensive data basis was needed. Within the SPACE project the decision was made to use the linguistic ontology of WordNet (www.wordnet.org) because it can be implemented freely and with relative ease. An entry from WordNet is displayed below:

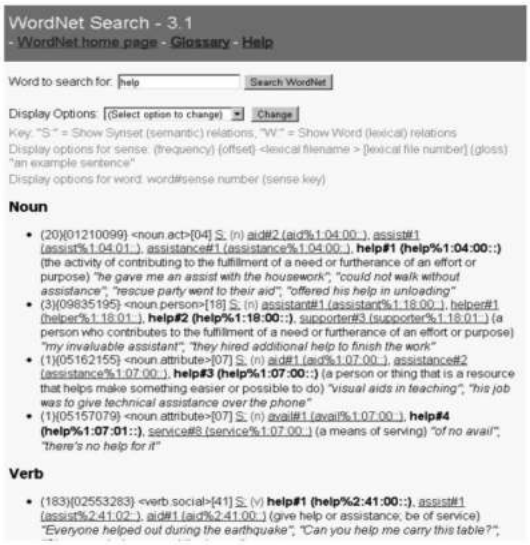

Fig. 1*. A search term in WordNet*

WordNet is a project hosted at Princeton University. It was incepted in the late 1980s, the first version WordNet 1.0 was published in 1991. It I a lexical database and while it contains compounds, phrasal verbs, collocations, and idiomatic phrases, the word is the basic unit. WordNet does not decompose words into smaller meaningful units a, though a comparison with componential analyses reveals some common aspects (Fellbaum 1998: 3).

While WordNet adds extensive helpful information to the single lexical entry, it was especially the ontological information that was especially useful for automatic analysis. The ontological part disambiguates words (but especially nouns) into their superordinate and subordinate categories, thus creating a network. The position of a lexical item in that network can then be used to scale the ontological depth of an item. The job of the software tool was therefore to run statistics on the scaling of items in given texts.

The Complexity Analyzer (Complexana, from an earlier working title *Semana* for Semantic Analyzer) was developed as a standalone application but it fulfills several computational tasks on a text.

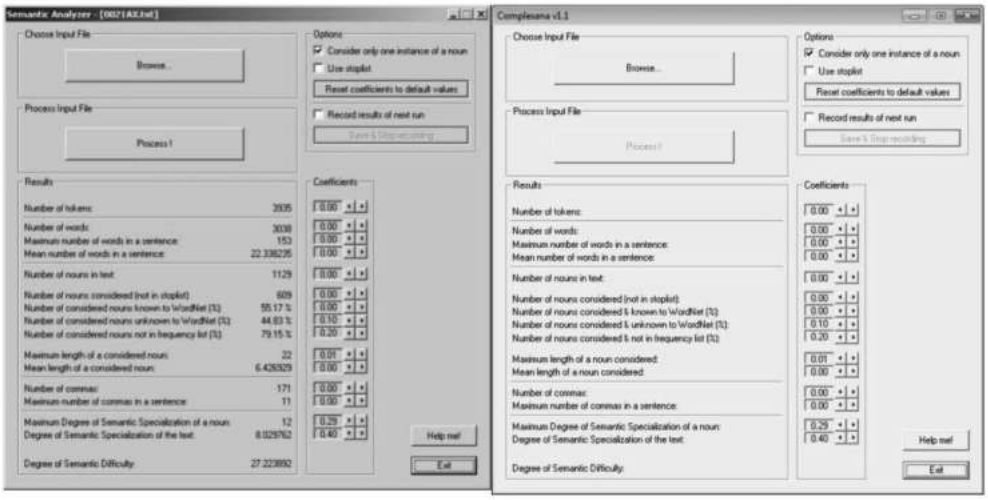

***Fig. 2**. Initial and final version of ComplexAna*

The application was designed for ease of use even for non-computer minded students of humanities. It represents a one-click solution but on the side of the learner the results need interpretation.

3.2 ComplexAna functionality

Using the WordNet implementation as a basis we developed a tool that enables a quantitative comparison with different texts. The tool was written in Perl, using a license-free Linux implementation of WordNet in a compiled form. This implementation is a working environment that can be packaged up and bundled with the tool in a self-contained executable.

The application requires the input of a raw text (txt format) as a user interaction. The first step uses a part-of-speech tagger (the free TreeTagger was fully implemented) to tag the entire text. TreeTagger provides overall robust accuracy and is even superior when nouns are concerned. At the same time types and tokens in the texts are counted. The tagging is the first process because ComplexAna uses exclusively the nominal items to profile the semantic complexity of the text. The tagged file is saved.

In the second step ComplexAna extracts all nominal items that were identified in the tagged text. These items are written in a separate file. We also added extended functionality for

stoplists and better control for excluding items that generate fawlty scores (discussed in section 4).

In the third step all nominal items from the text are queried in the implemented version of WordNet. From the query results the position of the item in the ontology, its semantic depth is calculated. This score is coupled with a series of terms that are also calculated in dependence on the result of the WordNet query. These can be seen in figure 3:

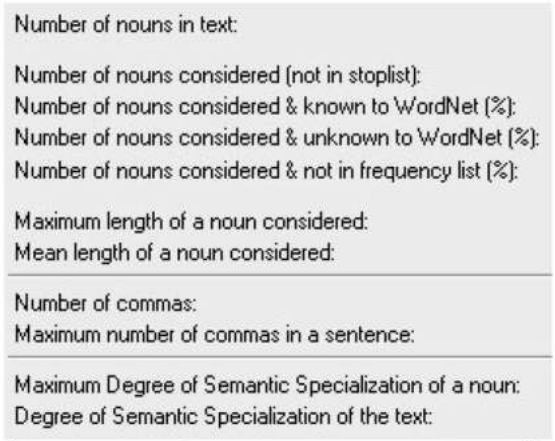

Fig. 3. *Nominal parameters for automatic semantic profiling in ComplexAna*

The parameters are used for correction terms that influence the main parameter, the degree of semantic specialization of the nouns.

Finally, a single score is calculated that summarises the semantic complexity of the text. This is a dimensionless number. It works only in comparison with the numbers obtained from other texts.

4. A sample Study

4.1 Complexity of SPACE

For the study, learners were asked which items in a text they found problematic or difficult. Further, they were asked to process original texts from the SPACE corpus. All students majored in humanities subjects so the scientific articles were very difficult for them. All popular articles were impressionistically rated comprehensible.

The following table shows that this is not a phenomenon that depends on the frequency of the difficult words.

Subcorpus	frequency list (20)
arXiv 0001AX-0046AX	mass, energy, time, number, quantum, length, hole, stars, case, data, scale, density, state, probability, terms, model, order, code, field, value
New Scientist- physics 0001NS-0046NS	quantum, universe, energy, theory, time, space, light, matter, gravity, particles, physicists, years, Earth, holes, idea, issue, page, stars, physics, magazine
PNAS 0047PN-0107PN	cells, cell, data, DNA, gene, species, table, rate, time, analysis, results, control, stress, number, group, levels, expression, effects, sequences, mice
New Scientist-biosciences 0047NS-0107NS	cells, genes, team, years, researchers, fields, species, field, farmers, water, DNA, gene, people, cell, human, primates, work, way, core, animals

Table 4. *The most frequent nouns in SPACE (distributed according to subcorpora)*

Section VI

Computer Assisted Language Learning : Case Studies

Chapter 28
The Effect of Priming Name-Referent Pseudo-Words on Memory through MMRLX2012 Software

Ali Roohani& Mahdi Modrek
Shahrekord University, Iran
Islamic Azad University – Najafabad Branch, Iran

1. Introduction

Anderson (1976) suggests that memory is of two kinds: implicit and explicit. According to Kolb and Whishaw (2003), implicit memory is a type of memory in which previous experiences aid in the performance of a task without conscious awareness of the previous experiences. In daily life, people rely on implicit memory in the form of procedural memory, the type of memory that allows people to remember how to tie their shoes or ride a bicycle without consciously thinking about these activities (Schacter, 1987). As Kolb and Whishaw state, evidence for implicit memory arises in priming, that is, a process whereby subjects show improved performance on tasks for which they have been subconsciously prepared. Research into implicit memory indicates that implicit memory works through a different mental process than explicit memory (Schacter, 1987). A wide range of experimental research has been carried out in the field of cognitive psychology on the effects of priming on human memory (e.g., Naito & Komatsu, 1988; Perea & Lupker, 2003). According to the research on the effect of priming, unconscious and effortless exposure to stimuli contributes to the process of the subsequent learning (Schacter, 1987). In other words, priming occurs when an earlier stimulus influences response to a later stimulus. For example, when a person reads a list of words which includes the word *table*, and, later, he or she is asked to complete a word starting with *tab*, the probability that the person answers *table* is higher than for nonprimed words.

Repetition priming represents a common form of priming where repeated encounters with an item result in faster and more efficient processing of the item (Gabrieli, 1998). An initial presentation of a stimulus influences the way in which an individual will respond to that stimulus when it is presented at a later time (Goldstein, 2008). In other words, a faster response to a stimulus resulting from repetition priming will occur even if an individual does not consciously recall seeing that particular stimulus. Thus, repetition priming seems to be an automatic process in the absence of awareness, which is in stark contrast to explicit memory, which is the conscious and intentional recollection of previous experiences and information (Petri & Mishkin 1994). The present research aims to study the effect of repetition priming on remembering name-referent pseudo-words in picture-based tasks. Pseudo-words, which are

used in psycholinguistics to study nonsemantic language processes, are word-like transcriptions (e.g., Mej) consisting of phoneme pairs from real words.

Meanwhile, computer software technology can be well suited for a highly-accessible, non-threatening environment to learn vocabulary. Such systems might even resolve the tension by providing enjoyment in vocabulary learning/acquisition through carefully constructed incidental acquisition tasks. It is assumed that such software tools are more useful when they reflect the traces of implicit or incidental learning and the focus of tasks is independent of the memorization goals. The present study seeks to investigate this assertion through a type of software called Memory Master Research by Language Exchange 2010 (MMRLX2010) designed in line with the assumptions of incidental vocabulary acquisition/learning since, as Ellis (1994) claims, the fundamental gap in second/foreign (L2) research studies concerns with the reflection of explicit/implicit language learning processes on human cognitive capability. The MMRLX2010 indirectly requires English as foreign language (EFL) learners to commit new words to memory. In this way, it seeks to strike a balance between explicit memorization and implicit learning. Taken together, this study examines the effect of repetition priming on remembering pseudo-words through MMRLX2010 software, where priming stage is followed by memorization stage in recognition and production tests.

2. Background

Using computer technology with the aim of helping language learners to learn vocabulary is one of the ways in which Computer-Assisted Language Learning (CALL) has been used in language education. Concerning Computer Assisted Vocabulary Learning (CAVL), Licenjack and Filologia (2007) investigated two alternative methods of learning words (i.e., traditional and CALL-based). The control group was asked to study a series of adjectives within a period of seven days without any access to *Word Processing* software. They were left free to memorize the lexis in the way they chose themselves. But, the experimental group was given the access to the software and the opportunity to learn the new lexicon via computers in seven days. Results showed that the experimental group had a better performance in terms of learning adjectives. In another study, Aist (2002) used computer-assisted oral reading to help children learn vocabulary. He built a project LISTENN'S Reading Tutor, a computer program that would adapt automatic speech recognition to listen to children reading aloud, and help them to learn to read. To learn a word from reading with the Reading Tutor, students had to encounter the word and learn the meaning of the word in context. He compared the Reading Tutor to classroom instruction and to human-assisted oral reading as part of a study with second and third graders. He found that second graders did about the same on word learning in all three conditions. However, third graders who read with the Reading Tutor performed significantly better than other third graders and even comparably with other third graders who read with human tutors. Also, in an Iranian EFL context, Shahrokni (2009) studied the effect of online textual, pictorial, and textual pictorial glosses on the incidental vocabulary learning of 90 adult elementary Iranian EFL learners. The participants were randomly assigned to three groups and exposed to the research treatment. During three sessions of instruction, five computerized reading texts including 25 target words were studied. The participants read the text for comprehension and, at the same time, were able to consult the glosses attached to the target words. Having read each text under each research condition, the participants were tested on their incidental vocabulary learning through two research instruments, word and picture

recognition tests. Results indicated that a combination of text and still images resulted in significantly better incidental learning.

Although there is much research on the use of the computer for lexical skill development, in terms of linking CALL with vocabulary learning/acquisition, there are quite a few studies on priming in the field of vocabulary learning. In a study, Hino, Lupker, Ogawa, and Sears (2003) investigated cross-script masked repetition priming and word frequency effects for Japanese words and nonwords. It should be noted that in the masked priming, a forward masked, is usually presented very briefly to prevent participants from developing strategies while responding to target words (Neely, Keefe, & Ross, 1989). This prime is followed by the target word. Under these conditions, participants are not aware of the priming. The participants of Hino et al.'s (2003) study were 48 undergraduate students from Chukyo University, who were all native Japanese speakers with normal or corrected-to-normal vision. Half of the participants received Japanese Kanji primes and Katakana targets whereas the other half received Katakana primes and Kanji targets (It should be noted that modern Japanese employs three scripts: Kanji, hiragana, and katakana). In the lexical decision task, masked repetition priming effects were observed only for word targets. The effects were larger for targets presented in an orthographically unfamiliar script than for targets presented in an orthographically familiar script. In contrast, in the naming task, masked repetition priming effects were observed for both word and nonword targets. Besides, the repetition priming effects were similar for word targets, regardless of the orthographic familiarity of the targets. Also, Munson (2006) examined an alternative method for assessing the ability to create both abstract and specific phonological representations using a single long-term repetition priming task. The task comprised of two phases. In the study phase, children were presented with a string of nonwords without a referent. After a distracter task, children were engaged in a test phase that measured some aspect of their implicit learning of the nonwords presented in the study phase. In the test phase, the participants were asked to repeat nonwords. The participant's knowledge was gauged by measuring repetition accuracy. The results showed that the participants repeated the studied sequences more accurately than the unstudied sequences.

In light of the above literature, it can be assumed that memory retrieval depends on the availability of language cues or primes to activate the appropriate memory traces. Thus, feeling the need to better uncover the role of priming in L2 vocabulary learning and filling the research gap which is felt to exist in the literature regarding repetition priming, this study intends to explore repetition priming in word-picture associations in vocabulary learning. In other words, this study uses MMRLX2010 to set forth a method of computer-assisted repetition to shed more light on the effect of priming on remembering word-picture associations. As this study deals with components of memory involved in vocabulary learning, it provides language instructors with a better insight through the mental organization and retrieval activities involved in this process. This study is also significant since it can help researchers to better understand the construct of retrieval memory and improve existing models of word processing, leading them on the way to better techniques in L2 vocabulary learning by means of computer programming science.

3. Purpose of the Study

The study intends to investigate the effect of repetition priming on memory (i.e., on remembering word-picture associations) in recognition and production tests in an L2 context. In this study, the word-picture association is limited to name-referent pseudo-words, that is, the

words which are not real words of language, but refer to real objects or entities in the real world. Besides, this study seeks to explore the rate of repetition which is so effective for the remembering name-referents through word-picture pair tasks. To these ends, this study makes use of MMRLX2010 software, which is designed for the purpose of this research. Accordingly, the following research questions are developed:

1. Does the priming/repetition priming have any significant effect on remembering name-referent pseudo-words in the production and recognition memory tests?
2. Does the rate of repetition priming have any significant effect on the production and recognition memory tests? If the answer is positive, what rate of repetition priming is likely to be more effective in remembering name-referent pseudo-words?

To examine the two broad research questions, the following four null hypotheses are addressed. Meanwhile, since each research question concerns both production and recognition tests, two separate null hypotheses are developed to examine each research question of the study.

- H_{01}: Priming/repetition priming does not have any significant effect on remembering name-referent pseudo-words in the production tests.
- H_{02}: Priming/repetition priming does not have any significant effect on remembering name-referent pseudo-words in the recognition tests.
- H_{03}: The rate of repetition priming does not have a significant effect on remembering name-referent pseudo-words in the production tests.
- H_{04}: The rate of repetition priming does not have a significant effect on remembering name-referent pseudo-words in the recognition tests.

4. Method

4.1. Participants

Eighty-five EFL undergraduate students including 43 male and 42 female at Islamic Azad University of Najaf-Abad participated in the study. All were native speakers of Persian, who voluntarily took part in this study. They were junior and senior EFL students, majoring in Teaching of English in 2010-2011.Their age ranged from 19 to 24 and had no auditory or visual problems when the data were collected.

4.2. Materials

The data of this study were collected through computers equipped by windows XP and Memory Master Research by Language Exchange 2010 (MMRLX2010) software in the computer center at Islamic Azad University, Najafabad Branch. The MMRLX2010 used in the study was developed by the researchers in IranLX Studio. The software was designed in Delphi 7.0 and equipped with MYSQL (My Structured Query Language) as database and a voice recorder/player. It took about 8 months to design the framework, create graphics, and write the codes for the software. The MMRLX2010 is a multi-purpose software, making possible to replicate the priming experiments with various words and nonwords in various memorization time.

4.3. Procedures

First, the participants were asked to carry out the registration stage on their computers by filling out a background questionnaire displayed automatically on monitors when the program

was run. The questionnaire included information about their name, gender and age. Some of the information required by the program was optional so that ethical considerations would not be violated. In the registration stage, they were asked either to report their visual or auditory problems if they had any or to quit if they were not willing to report them since these problems could invalidate the data. Meanwhile, the instructions given by the software were both in Persian and English to make sure that the participants would understand them well. Second, they were asked to start the next stage of the study (i.e., priming stage) by pressing the "Enter" button on the keyboard. At the priming stage, a fixation dot was displayed at the center of a blank page on their monitors. Then, this dot was replaced by series of slides which consisted of word-picture pairs. As Figure. 1 shows, each pseudo-word (i.e., stimulus) consisted of three letters, displayed 0.6 cm above the fixation point. The name-referent picture included a real object, displayed 0.6 cm below the fixation dot. The participants were asked to read out the name-referent pseudo-words to the microphone they had.

***Fig. 1**. Word-picture display in the priming stage*

This study did not make use of real English words in order to minimize the effect of background knowledge, which could confound the results of this study. In addition, as Bird and Williams (2002) point out, using pseudo-words in experiments can provide evidence for real words. The pseudo-words were all monosyllabic (e.g., Mej and Tem), having consonant-vowel-consonant (CVC) structure so that they could be processed more quickly. Meanwhile, the results of a pilot study with a group of participants with almost the same educational and age characteristics as those in the main study had indicated that the participants' short-term memory could seriously face problems as soon as they were exposed to more than six word-picture pairs. That is why six pseudo-words were selected for the priming stage. Besides, the rate of repetition priming for pseudo-words varied in the priming stage so that the effect of rate of priming on remembering name-referent pseudo-words could be further examined. The rate of repetition priming included 1, 2, 4 and 6.

Third, the participants were asked to memorize pseudo-words. As displayed in Figure. 2, 12 pseudo-words, six of which had already been presented in the priming stage, were displayed on the monitors of computers. In other words, six pseudo-words were primed and six ones were nonprimed. The time of presentation inthis stage was 45 seconds. According to the results of

the pilot study, this amount of time was sufficient for participants to make an association between the words and their name-referents.

Fig. 2. *Pseudo-words in the memorization stage*

Fourth, the participants were required to take production and recognition tests. The production test included a sequence of 12 slides displayed in random order. On each slide, a picture which was approximately 3.4 cm long and 0.6 cm wide was displayed. A voice recording system was automatically activated at this stage. The participants were asked to name each picture through the microphone and then press "Enter" button for next one to be displayed. Their responses were automatically saved by MMRLX2010. The recognition test included 12 items (i.e., 6 primed and 6 nonprimed items). In the test, 12 pictures were displayed on the monitors one by one. Below each picture, five choices were given. One of them included "I don't know" and four of them included four pseudo-words, one of which was the key answer.

The production test preceded the recognition test. Naturally, recognition precedes production in the process of language learning. However, if the recognition test had preceded the production one, the participants might have made use of the items in the recognition test to improve their memory and retrieve information. Besides, the participants were asked to produce all the primed and nonprime pseudo-words. That is why it was assumed that the production test or output could not invalidate the data in the recognition one.

After the production and recognition tests were administered, the results were displayed to the participants. Each participant could see the number of correct and incorrect responses in the production and recognition tests. The results output was comprised of two different modes: "User Mode" and "Admin Mode". The "User Mode" was displayed to the participants and the "Admin Mode" was displayed to the researchers for further data analysis. Figure. 3 displays the output in the "Admin Mode".As the Figure. 3 displays, the researchers had access to the raw scores, frequency, percentage and rank order data produced by the software. The obtained data were exported to the SPSS for further analysis.