The authors are presenting a hyper-textual, multi-media e-learning object, “English Practice in Computer Science”, composed of didactic units for learning and reinforcing English in the specific field of Computer Science. These units may aid not only learners in this field, but also others involved in various scientific areas of study at university and secondary school level. Each unit contains a text and a glossary with audio, grammar focuses and a series of exercises with automatic correction, specially designed to develop comprehension and interpretation techniques and to reinforce recurrent linguistic structures in a specific language context. A notional-functional didactic approach has been used, allowing the learner to participate fully in the learning process. The use of multi-media instruments (audio, music, captivating images and user-friendly icons) allows the learners to develop reading, writing, listening and pronunciation skills in a highly communicative and enjoyable environment.

Key words: e-learning; multi-media; English; Computer Science

1. Introduction

The e-learning object “English Practice in Computer Science” was produced within the “Proteo”, Project for the development and experimentation of the
efficacy of e-learning objects in a wide variety of subject areas, in the Rete Puglia Centre, President, Prof. Sebastiano Impedovo, University of Bari “Aldo Moro”.

It has often been noticed that frontal lessons based on text-book learning are sometimes just not enough to capture and hold the learners’ attention. Extra stimulus is required to promote the learning process. Based on this fundamental observation, the authors decided to develop a hyper-textual, multi-media e-learning object as a stimulating support for traditional frontal English courses.

The main aim of this e-learning object is to develop and reinforce the linguistic techniques required by learners of English in the specific field of Computer Science, but it may also be used as an aid to learning in other areas of scientific study, both at university and secondary school level. The didactic units contained in “English Practice in Computer Science” have been devised to integrate as many linguistic skills as possible: reading, writing, listening and pronunciation, allowing the learners to communicatively enter into the specific context of their field of studies. A hyper-textual environment allows learners to expand their capacities in their own time, without the constraints of a frontal lesson and to follow their own individual path through the units, thus taking an active part in their own learning process. It also allows the teacher to constantly monitor the learners’ progress by collecting data related to the exercises performed and to evaluate the efficacy of the product. Multi-media instruments make the e-learning object communicative and enjoyable to use, giving learners extra stimulus to “play” with the units and challenge themselves in the automatically corrected exercises, just like a computer game.

2. Motivation and specific learner needs

Based on an accurate initial analysis of the learners’ English linguistic background (test and questionnaire), the authors have observed that, in the particular case of Computer Science students, most have already studied many years of English at school (primary, middle and high). Some, based on positive past experience both at school and outside, have developed a certain feeling for the language and already display a reasonable command of it. Others, due to past incomprehension and consequent feelings of insecurity, actually dislike the language and even firmly believe they are just not linguistically inclined. These learners tend to “fossilize” at some stage in their studies, so that, even if they attend classes regularly, they fail to reach full linguistic competence. Frequently, a potential discontinuity has been noticed between language learning levels in universities and schools. For example, even learners who have studied English for many years at school do not necessarily demonstrate a good working knowledge of the language at university level and need a stimulating support to counteract their often sub-conscious resistance to second language learning. These learners require particular motivation and reassurance in a well-structured communicative linguistic environment, both in the classroom and in the laboratory or at home.
A multi-media e-learning object is an ideal tool for providing an interesting aid, whatever the learners’ initial level of linguistic competence. It provides an innovative way to study, which, in this case, combines specific English language learning with computer technology, which is, after all, the core of the learners’ chosen degree course studies. In fact, these particular learners need English language skills to deal with the vast quantity of material they encounter daily during their studies (text books, reports, manuals, Internet pages etc.). To be able to develop these skills in combination with their passion - the computer - adds significantly to their motivation.

3. Didactic Aims and Methodology

We know that the second language learning process involves various psychological, linguistic and environmental factors [Kramsch, 1998]. Therefore, the learners’ background knowledge of the subject matter in their mother-tongue is considered important, as well as the knowledge of linguistic structures in their own language. The methodology adopted for “English Practice in Computer Science” is based on activating prior knowledge and allowing the learners “to build cognitive skills required to understand, process and interact with the language” [Plass and Jones, 2005]. The three stages identified by Plass and Jones in the cognitive approach for second language learning have been considered: (i) the input is what a teacher gives to the learners, the material which will “feed” them; (ii) the interaction and processing of the information is important to ensure that the material used is linked to previous learning; (iii) the output is the communicative linguistic competency which a learner acquires after being exposed to the learning object. Therefore, the authors chose to adopt a notional-functional approach to language learning when developing “English Practice in Computer Science”, in order to make the environment as communicative and effective as possible. The notions are the basic linguistic structures previously learnt in class and the functions are the way in which these structures are actually used in a specific language context.

The aim of the e-learning object is to help the learners to bridge the gap between the cognitive structures they already know from previous studies and their own cultural background and what they should effectively learn at an academic level. The systematic approach aims to re-order any notional confusion, which is often wide-spread in today’s language learners. Indeed, learners tend to mindlessly reproduce previously memorized structures without really knowing how or when to use them properly. “English Practice in Computer Science” reinforces the structures and their correct use in context. The more often learners are exposed to this environment, the more patterns will start to emerge and be recognized, not only notionally but also functionally. Computer Science students will easily recognize recurrent patterns in the texts related to their field of studies, for example, understanding the basic structure of a computer, classifying the devices in a computer system and using basic terminology such as “hardware”, “software”, “operating systems”, “components”, “binary system” etc.. As they become progressively more immersed in the e-
learning object, the recurrent grammar structures will also become clearer, for example the use of the “ed” and “ing” forms, regular and irregular verbs etc.. During this “full immersion” in the specific English language, the learner’s mind will start making suitable connections between his/her past and present language experience and finally “click” into the right place.

“English Practice in Computer science” puts the learners at the centre of the stage of language learning, so they become the principal “actors” in their own learning process: “The learners are social performers with tasks to execute in a given environment and in a specific field” [our translation from “Le français sur objectifs spécifiques et la classe de langue”, CLE International, 2007]. The use of authentic texts dealing with various aspects of Computer Science has been considered fundamental for stimulating the learners’ interest. Thus, they may acquire techniques for deciphering the written word in their specific subject area in an enjoyable multimedia environment.

The principal didactic skills developed and reinforced in the learning object are: skimming (reading for global comprehension of a text), scanning (reading to find specific information or concepts), completion (cloze tests), matching information (tables and diagrams for the transfer of information), question formation, word formation (recognition of typical prefixes and suffixes), vocabulary study (recognition of synonyms and antonyms) and sentence formation (manipulation of verb tenses in sentences, use of articles). The use of audio favours pronunciation practice and consolidation.

The time factor is also considered to be fundamentally important psychologically for the learners. A hyper-textual e-learning object allows them to work through the didactic units in any order they wish and at their own speed, thus promoting a more relaxed and personalized learning environment. The facility of self-evaluation in the automatically corrected exercises also offers extra stimulus to the learners to challenge themselves and try repeatedly to find the correct answers [Cives et al., 2001].

“English Practice in Computer Science” has been designed to be used mainly with the support of the teacher, whose presence must also be considered important to monitor the learners’ progress, answer questions and reassure them during the learning process. However, it may also be used as a self-study complementary object, due to the availability of an answer key to the exercises.

4. Contents

The authors have deliberately “packed” all related information together in individual units, in order to organize linguistic concepts in logical groupings and thus facilitate the learning process. “English Practice in Computer Science” is therefore structured in units, which may be accessed according to the needs of each individual learner. Every didactic unit consists of:

- a short text, with audio, dealing with an aspect of Computer Science, which is the vehicle of the learning object: learning through texts makes it possible to
study both syntactic and pragmatic language domains and also favours “sub-conscious” learning;

- a glossary link, to draw the learner’s attention to specific terminology used in the text;
- concise grammar focus links with explanations of the most recurrent linguistic structures in the text, with audio;
- automatically corrected comprehension quizzes related to the text (“reading for main idea”, “reading for detail”), to encourage the learners to understand the meaning from the context;
- a selection of automatically corrected exercises which are both focused, since they concentrate on a single grammatical aspect, and comparative, since they require thoughtful application of the concepts inside each single text.

The didactic path among the units is flexible: the learners can access the units, consult the grammar explanations, glossary definitions and perform the exercises linked to each text in any order they wish. Thus, the learners can create their own personal didactic path.

5. Software and tools utilized

The e-learning object “English Practice in Computer Science” was developed using Lectora Publisher by Trivantis, licensed to the Rete Puglia Centre. Lectora is a software package that enables teachers to easily create interactive didactic contents within the e-learning standards and then automatically publish the tasks. This allows the developers to concentrate on the pedagogical aspects of the software. Although basic training is required, Lectora Publisher is extremely user-friendly as it runs on Windows. Furthermore, it provides a good selection of exercise types (multiple choice, true/false, text-entry, gap-filling) and supports a range of media types (audio, video, image, text etc.). The exercise models in Lectora have permitted the authors to create tasks such as comprehension questions (main idea and true/false), language noticing, vocabulary and grammar practice.

The use of different colours in “English Practice in Computer Science” encourages the learners to focus on certain structures, patterns and words. For example, in all the texts different colours have been chosen to indicate various linguistic and morphological structures. The colour blue has been used for words linked with the glossary, since it is usually seen as a reassuring colour, so the learners know not to worry if the meaning of the word is unknown. The colour purple is always used for contextual reference words. Green is used for some grammar focus explanations and certain words in the grammar exercises, as it gives “hope” to the learners and red has been used mostly for verbs, to underline their difficulty and the absolute need to study them properly.

The use of user-friendly symbols, icons and tables helps the learner to relate the image to the concept to be learned, thereby speeding up the processing of information and stimulating associations in context. They also help the learner to remember linguistic functions in a pleasing way.
6. Navigation in a sample unit

In order to make the content of the e-learning object clearer, a sample unit of “English Practice in Computer Science” will be illustrated.

![The Birth of Computer Science](image)

The unit starts with a short text with images (Fig. 1). The learners are free to choose if they want to listen to the audio or not for reinforcing pronunciation, by clicking on the audio icon: they can navigate according to their own needs. “English Practice in Computer Science” is asynchronous because learners can focus on different things. Some of the learners study faster and will quickly finish reading, while others will want to pause, to click on words they don’t know or re-listen to the text. Each text has links for glossary (words in blue), grammar (words in red and purple) and exercise links. Along the bottom of the slide there are navigation buttons: learners can click on one of the two comprehension exercises related to the text: “reading for main idea” or “reading for detail” or proceed with the forward arrow to the next part of the text. There is always an exit button, so that learners can leave the unit whenever they wish.
“Reading for Main Idea” (Fig. 2) is a useful exercise because it creates interaction: the learners have to “process” the information in the text and then make decisions using this information. They have to decide if the sentences express the main idea (clicking on M.I.), a false statement (clicking on F), a detail (clicking on D) or a fact which is not stated in the text (clicking on N.S.).

“Reading for Detail” (Fig 3) is a further step to help the learners focus on performance improvement: they have to consider different statements, decide if they are true or false by referring to the text and click on T or F. If the sentence is false, a menu of possible correct answers appears for the learner to choose
The focus is thus not only on the information (the text), but also on performance: learners have to think, decide and “act”.

Fig. 4 Grammar focuses

In the grammar focuses (Fig. 4) the learners may view the nucleus of “English Practice in Computer Science” and contemporaneously improve their pronunciation by listening to the audio. The first example explains the various uses of the “ed” and “ing” forms, which are very recurrent structures in the specific text and the second deals with “contextual reference”, a vital comprehension technique in deciphering texts. Each grammatical point is explained with the aid of tables that are also interpreted verbally. This allows the learners to reflect on what is occurring at each level of the table, observing the linguistic structures in the first column and the related examples of use in the second. The use of concise tables makes the grammar point clearer and easier to handle. “Memory is enhanced if a relevant visual image is presented or if the learner can associate a visual image to the verbal information” [Anderson and Bower, 1973].

There are specific exercises (Fig. 5), linked to each grammar focus. Learners have to adapt the sentences given in the exercise to the explanation in the grammar focus: “who climbs the grammar-tree distinctly knows where noun, verb and participle grows” [Fromkin, Rodman, 1983]. The first exercise in Fig. 5 consists of analyzing the “ed” and “ing” forms in the context of the sentences given. The second exercise reinforces the technique of “contextual reference” - linking the words in purple to the subject, object or that part of the text to which they refer directly. At any time learners can click back to the grammar focus to revise and reinforce their knowledge.
Each answer given in the exercises is immediately evaluated by the system (Fig. 6), so the learners can see at once if it is right or wrong, click back to the grammar focus if required and try again until the answer is correct. A correct answer produces a smiley face and when a wrong answer is given an angry man with smoke coming out of his ears appears. This promotes humorous, stimulating self-evaluation.

7. Experimentation

At the moment, the didactic units developed are available online, but only to restricted groups of students who enrol through the authors. They were tested on a sample group of students attending the English course for the Bachelor Degree Course in Computer Science. The students were highly
motivated by the use of authentic texts and therefore found the course content interesting. They found the use of a multi-media program for studying the linguistic and morphological structures of the English language more enjoyable than using an ordinary text book in the classroom. The captivating images used held the learners’ interest and the use of audio – relaxing songs to start the units and musical inserts during the exercises were popular. Listening to a mother-tongue English speaker reading the texts, grammar explanations and glossary definitions was also valid pronunciation practice. The learners were in fact motivated by the self-evaluation aspect of the exercises, seeing them as a challenge and repeatedly trying to find the correct answers, thereby reinforcing the learning process.

8. Conclusions

“English Practice in Computer Science” has proved to be a truly valid English language learning tool in the specific field of Computer Science. The learners were able to communicatively develop the language skills required and made helpful comments on the material used. The authors hope to expand the units already created and to use them in other scientific fields of study both at university and secondary school level.

Bibliografia


