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Connecting, motivating and raising awareness via WELL: Developing e-learning environments for science students

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Abstract

This paper discusses the role of customized learning environ1ments in the teaching of English to undergraduate science and technology students and focuses on a more subject-specific and skills-oriented approach in English for Specific Purposes (ESP). It may be argued that multimedia technology and the Web have a vital role to play in integrating often complex subject matter and language learning. As most university level students nowadays are mostly conversant with multimedia and Computer Assisted Language Learning (CALL) packages and feel at home before a web-based interface, creating teaching materials to cater to their needs requires a whole new set of skills, not least a knowledge of Web-design and Web-authoring programmes. Educators now need to create environments in which students can learn; they engineer new situations. Let us call it "WELL by design". The focus is on motivating learning, a move towards constructing knowledge and involving the students in meaningful interactions. This paper focuses on how web-based materials are incorporated in day-to-day classroom teaching, how students are encouraged to interact with these materials, and how interaction is promoted and encouraged through the creation of pair and group activities based on the materials. Particular attention will be given to the potential of Web Enhanced Language Learning (WELL) in encouraging collaborative and constructive learning processes. The relationship between tutor and learner in a technology-enhanced environment will also be considered and discussed. A demonstration of specially devised link-mediated learning units within a web-enhanced course in ESP designed specifically for environmental science students will be made, together with an overview of resources, tools and observations within the context of the technology classroom. Particular emphasis will be placed on CALL and WELL as an essential support within a fully integrated language course for science students, as well as on the community-creating and connecting spirit of the Web in a virtual language learning environment.

1 Introduction

In recent years the potential of CALL has become a hot topic of debate among the foreign language teaching community worldwide. The difficult and often conflicting relationship between technology and language learning continues to plague and challenge language experts, linguists, and students alike. Effective CALL programs should give students the opportunity to hear/read comprehensible input, to negotiate meaning, and to

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produce/write comprehensible output. The introduction of CALL technologies in university language programmes has forced teachers to re-think and often modify their whole teaching approach. It has forced them to acquire new skills, to update their already existing skills, and to take on greater responsibility for the educational choices they make. The adoption of technology is making more demands on the teacher whose new, emerging role entails possessing increasingly complex skills. Nowadays, a teacher can assume multiple roles of educational content provider and web developer, multimedia presenter and e-moderator, and must become aware of the social aspects of computer-mediated interaction and communication in what is steadily becoming the "Information Age".

In what follows, experiences and observations made in the creation from scratch of an online learning environment designed and developed for undergraduate environmental science students are described. Functional examples and good practice models are highlighted with a focus on new media incorporated into Languages for Specific Purposes (LSP) teaching. Particular emphasis is placed on WELL, on the encouragement of learner autonomy, and on a more cognitive-constructivist approach to learning. Tools and techniques adopted to promote active student participation in a web-enhanced environment are outlined together with better practice teaching examples, with an emphasis placed on student motivation and active participation in the learning process. A series of practical examples as well as targets, skills development, and learning objects are given in the context of a course website aimed at environmental and earth sciences called *Greenspeak* – part of a broadly-focused online project currently running into its sixth year entitled *English for Science* (Canapero, 2003).

With the arrival of the Internet in the mid 1990s and an ever-increasing proliferation of websites, new roads have been opened up in the creation and development of materials for learning and language learning. University students crowd computer laboratories to catch up with e-mails and mobile text-messaging, to engage in synchronous and asynchronous Computer Mediated Communication (CMC) using Web-conferencing programs, and to keep up to date with news and current affairs through the various online media networks. Whether we like it or not, a whole new world of learning, of clicking, navigating and downloading is taking place at an ever relentless pace (see Note).

Consequently, teachers, tutors and professors have to accept new challenges. Rejecting new technologies and approaches is too limiting. Our students have access to 3-D video games, full-immersion virtual reality, MUDs (Multi Use Dimension), MOOs (MUD, Object Oriented), MUSHes (Multi User Shared Hallucinations), MUVESs (Multi Use Virtual Environments), synchronous chat lines, web communities, on-line forums and so on. The teaching community has no choice but to meet this challenge, and fast. Clearly, educators need to acquire new skills and tools to rise to such a challenge. By taking advantage of new technologies and mastering the latest web authoring tools for creating web-based materials and incorporating interactivity into their online language sites, teachers are now exploring ways of creating new learning environments and catering to the ever-changing needs of their students.

2 Exploiting the World Wide Web and deciding to commit to a web-based teaching project

When a teacher decides to embark on a web-based project of any kind, there are

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many 'hats' to wear – a librarian hat to determine what resources are available; an educator hat to choose from the resources available those that best address the educational goals of the project; information and graphic design hats to structure and present the materials effectively; a programming hat to execute the vision conceived. Most teachers can only don one or a couple of these hats, certainly not all. Seeking assistance in some areas is essential to the realization of an online project (Horton, 2000:3).

Creating educational web-enhanced materials is no trivial task. It is not simply a case of shoveling printed material onto the Web. The teacher has to adapt to new technologies and accept a natural evolution in web-based materials creation. As a teacher, it is vital to take part actively and whole-heartedly in the evolution of the Web and believe in its potential as a powerful educational tool. There is a constant need to reorganize, update, and expand materials in a course site to take better advantage of its capabilities. In other words, placing a classroom-based course online is a long, drawn-out process which demands a new mindset and attitude.

Adopting a new, technology-enhanced approach to teaching then raises the important question of investment in time and energy both on an individual and on a more institutional level, and of the added financial costs implied. Given the high cost in time and money of developing multimedia learning materials, it is critical to achieve economies of scope as well as economies of scale by making courseware components re-usable in multiple courses at low marginal cost (Felix, 2001).

3 Having committed to an online learning project: the financial and time constraints implied in its development.

The *English for Science* web-based project (Canapero, 2003) was launched in 1998 initially as a result of the author's own enthusiasm for the new medium of the Web, before being incorporated into the University Language Centre website as an ongoing project with an initial minimal outlay. For a project of this scope the human cost cannot be overlooked. Learning to adopt new technologies, having to participate in regular training sessions in web design and web authoring, and learning how to use technology effectively all comes at a price, both to the teacher in terms of the overtime needed to dedicate to projects outside normal teaching hours, and of the extra cost borne by the institution which pays its teaching staff for effective hours carried out on extra-curricula projects. On average, 40 per cent extra time is added to a teacher's weekly workload as a result of web project commitments, and the constant requirement for teaching and technical personnel to take part in training courses, workshops and seminars naturally has a bearing on the annual budget allocation of the institution.

How management deals with the demands of curriculum design, the needs of the students, departmental and institutional constraints, and still achieves economies of scale varies from institution to institution. In the case of Padua University, a great deal of financing comes from the Italian government in the shape of the 'Campus One' university incentives whereby certain funds are allocated to university departments across the board which then filter out to individuals, both teachers and technicians involved in officially recognized and approved annual projects.

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4 Developing an online course website: from the concept to the digital drawing board.

Web-materials creation for teaching purposes and on-line courseware development represent a whole new ballgame for the active web teacher and demand a new approach to one's teaching method. A web page on a screen cannot and must not be seen simply in terms of a reproduction or extract of text from a traditional coursebook. Once objectives have clearly been set based on the specific needs of the student, the teacher has to then decide how the pages should look on the screen, and more importantly, how the student is expected to engage and interact with the web pages. A good suggestion is to set out ideas in rough draft on paper first, before deciding how the pages link together and how themes connect. As Felix (2001) points out, as part of a good practice model, it is advisable to keep a web-based project simple and straightforward throughout. Web pages should not be overloaded with information or packed with images which detract from the main teaching object. A good way to ensure accessibility by all students is to maintain simplicity and clarity in design, keep the screen relatively uncluttered, and use consistent page layouts (Casey, 1999). This implies engaging in thoughtful planning while keeping learning objectives in mind. Making minimal use of technological 'bells and whistles' allow the largest number of users to access and get the most from a course. At the end of the day, technology is only a vehicle for meeting learning objectives and therefore the needs of the learners have priority – which is as it should be in the learner-centred online classroom (Palloff & Pratt, 2001).

An integral part of developing content for an online environment is to identify those web resources that are relevant to the course being delivered. It is important for a teacher to 'separate the wheat from the chaff' and find good, accurate, dependable sites for use in a web-enhanced learning environment. For the purposes of *English for Science*, websites have been carefully selected, and these have included the BBC's Science in Action and Horizon Special, the BBC Weather Centre's website on climate change, the London Royal Institute Christmas lectures, CNN's Science & Technology pages, Scientific American Educational and popular science sites such as Explorezone, Exploratorium, Scienceagogo, Scientific American Frontiers, dynamic sites such as Brainpop, the London Science Museum online, and Time Online's special report entitled *Visions of the 21st Century*, as well as environmental protection organizations such as Greenpeace, the World Wildlife Fund, and Friends of the Earth. In doing so, levels of lexical and grammatical intricacy and readability of the selected materials have been assessed in order to conform with a pre-defined set of learning objectives, before deciding how the contents of these online resources could be best incorporated into the course design framework. When locating relevant web resources for incorporation into the *English for Science* web-enhanced environment it has been important to bear in mind that the whole course is geared towards the *Threshold* (B1) level outlined in the *Common European Framework* by the Council of Europe (Van Ek & Trim, 1990).

5 Promoting active student participation and learner autonomy

But, as the saying goes: "you can lead a horse to water, but you cannot make it drink". Active student participation depends on the teacher's attitude toward the site. If a

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teacher chooses to regard it as an adjunct, students will then perceive it as merely supplementary, as additional and unnecessary work with little influence on what they may consider to be their most important learning outcome: passing the exam. As Horton (2000) stresses, to be effective a course website needs to be integrated into one's teaching method, and active student participation and engagement must be encouraged throughout.

With this in mind, teachers need to re-think their teaching approach when incorporating technologies into the classroom; prevent learners from staring blindly at screens without active participation; encourage student collaboration, communication, interaction and debate; promote thought and analysis, and stimulate creativity. Above all, they must make learning a stimulating, engaging, and personally rewarding experience. Much will also depend on the type of setting and atmosphere created. In the following case-study example, students enter what may be referred to as the "technology classroom". Here, students are not isolated physically from one another in cubicle-style computer stations, but sit together in groups of three or four at specially designed computer islands, conceived with the aim of creating more possibilities for group interaction and support. Simply inviting students to share a computer and to work together on online projects can also make for a more active, stimulating and above all welcoming learning environment and dispel the idea of sterile computer labs where students are blocked off from their peers by partitions and headsets.

Once students are made to feel at ease in front of a computer, and materials are explained clearly and simply, they will formulate positive associations with the online environment and make use of the resources to the best of their advantage. The teacher, on the other hand, needs to transmit his or her own confidence in the system and thereby promote a busy, lively and creative environment where many activities can be going on at the same time. The teacher's new role becomes that of a facilitator of learning or a 'guide' offering suggestions and leading students through the activities. At the same time, students are provided with the necessary learning tools, become more and more acquainted with the environment, and acquire greater autonomy and consequently take greater responsibility for their learning.

6 The importance of a cognitive-constructivist approach to online learning

We cannot talk about developing pedagogically-sound online learning environments without turning our minds to the concept of constructivism. The central idea underlying constructivism in teaching is that human learning is constructed, and learners build new knowledge upon the foundation of previous learning. This contrasts sharply with the idea that learning is the passive transmission of information from one individual to another, where reception, not construction, is key. The idea of constructed knowledge points us towards two important notions: the first is that learners construct new understanding based on what they already know and arrive at learning situations with the benefit of knowledge gained from previous experience. The second notion is that learning is active rather than passive. Learners confront their understanding in light of what they encounter in the new learning situation. If what learners encounter is inconsistent with their current understanding, their understanding can change to accommodate new experience (Fosnot, 1996; Steffe & Gale, 1995). As a result, learners participate actively in

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their own learning process: they apply current understanding, note relevant elements in new learning experiences, judge the consistency of prior and emerging knowledge, and based on that judgment, they can modify knowledge.

According to Jonassen (1995), constructivist learning environments provide multiple representations of reality, thereby avoiding oversimplification and representing the complexity of the real world. They emphasize knowledge construction instead of knowledge reproduction, as well as highlighting authentic tasks in a meaningful context rather than abstract instruction out of context. They provide learning environments such as real-world settings or case-based learning instead of pre-determined sequences of instruction, encourage thoughtful reflection on experience and, according to Brooks & Brooks (1993), enable collaborative construction of knowledge through social negotiation, not competition among learners for recognition.

In CALL traditional, objectivist activities are now transformed into real-world, complex activities or problems where learners are provided with the necessary tools, where media and information sources are varied, and most importantly where learning is anchored in action and active student participation.

7 The potential of WELL in encouraging collaborative and constructive learning processes

A number of constructivist principles have been applied to the design and development of *Greenspeak*, an online English language learning environment housed within the *English for Science* project and aimed at students studying environmental sciences, natural sciences, earth sciences, chemistry, environmental engineering, and for all those who are genuinely concerned about what is happening to the world around them. It is assumed that students approaching this environment already have a reasonable level of English, i.e. corresponding to at least five years of secondary education, and some prior knowledge of or at least interest in environmental issues.

When students enter *Greenspeak*, they are invited to embark on a journey of discovery, to metaphorically pack a rucksack and don their hiking boots. Here, learning is transformed into the metaphor of a five-part journey where the teacher takes the role of guide or a facilitator of learning, providing students with opportunities to test the adequacy of their current understanding, and to enable them to build on it step by step. This web-enhanced environment provides ample experiential learning opportunities. Students approaching *Greenspeak* for the first time are given an option in the introductory page: either to follow a guided learning path, or to plan their journey as they go along.

The website provides a structured, pedagogical framework in which students can move at their own speed and according to their different levels of understanding, and build gradually on their knowledge by progressing through the various stages of each "journey". At any time students may take a detour, bypass certain stages of the journey, and hop to another learning object elsewhere in the site. The choice is entirely theirs. The inherent flexibility of the learning programme is intentional. Each student will interact with the materials differently, operating from within different learning contexts, and require varying amounts of time between one activity and another. This flexibility and adaptability to individual student needs and the focus on individual experience are some of the more salient features of this web-based project.

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8 Greenspeak: An experiential learning experience lived through the metaphor of a journey

Having opted for the guided learning path in *Greenspeak* the student embarks on the first leg of a five-part journey. As the main objective of this course website is to provide the student with the necessary tools for reading and understanding scientific texts centred around environmental issues, the departure point is a short reading extract on the highly controversial subject of *sustainable management*. All reading material in the site is "chunked" so that unnecessary page scrolling is avoided, information can be assimilated in bite-size pieces, thereby respecting the needs of the web reader who, rather than staring blindly at long-winded streams of text, will tend to scan for information, skim, or even skip text and move quickly on to other pages. In the design of *Greenspeak* the new requirements of the web reader have been taken fully into account. As well as having an icon in the shape of a wooden signpost marked "next" which takes the learner on to the subsequent part of the guided journey, a pictorial menu clearly showing the five main categories is constantly present on the page.

Following the short reading extract, the student is guided to word-building activities which centre on the extract just covered and also touch upon soon-to-be-acquired vocabulary in subsequent activities. Interactive word-building activities come in the form of crossword puzzles, songs containing gap-fill or drag and drop interactions, numerous cloze, matching, and drag-and-drop activities, exercise drills on phonetics and stress-patterns present in keywords with embedded audio, as well as word association games. Interactivity has been incorporated into web pages using a number of web authoring tools, namely Dreamweaver Coursebuilder, Hot Potatoes and a gap-fill, Javascripted tool created in-house.

The next stage of the guided journey then takes the student on to listening activities which are specific to the environmental debate. An icon of a CB radio appears at the top of the page, the tapescript can be called up at any time, and activities, accessible by clicking on the radio knobs, are interactive with immediate user-friendly feedback provided. All audio files have been created using a combination of Apple Quicktime player and Macromedia Flash plugin 'movies'. No separate window is opened when the user clicks on the audio plugin, but the audio is simply activated directly with a single click on the screen. These user-friendly pages are intended to create a positive visual impact and be conducive towards motivating students to perfect their listening skills, without being overwhelmed with too much information at any given moment.

Having completed the assigned listening activities contained within the chosen learning path, the student is now confronted with a five minute piece of film footage taken from a Greenpeace video which focuses on the Frontline Summer 2002 project to save the ancient forests. A small video screen is embedded in the web page which, like all audio files in *Greenspeak*, is linked to an Apple Quicktime player. To the right of the frame, it is possible to call up the videoscript and also highlight keywords and their synonyms, created using the OverLIB authoring tool which enables colour-coded popup information boxes to be called up on the screen (Bosrup, 2002). Here, further examples of multimodal pages emerge, where multiple media types are used to present ideas and concepts. This only goes to highlight one of the most important advantages of web-based instruction: the ability to combine various layers of text, images, sound and

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moving images in a single page.[1] On the main console at the top left of the page, it is also possible to bring up comprehension activities based on the film-clip shown into the right-hand frame, as well as link to online dictionary tools for further lexical analysis.

9 Finding the right fit: tailoring web resources to meet specific student needs.

In web teaching, we may talk about "engineering" learning situations and "constructing" new learning environments. What is important for my educational purposes is to focus on relevant content, and to engage students in activities which are specific to their needs. The Web is a perfect medium to this end. If used creatively, it can represent a move away from static texts and mundane grammar drilling towards motivating through student involvement and connectivity. Naturally, everything depends on the teacher to select and make use of online resources imaginatively, to incorporate them within good, educationally-sound learning activities such as Webtask activities, and CMC activities such asynchronous web-conferencing projects and forums, and synchronous online chat sessions, whereby learning is facilitated through co-operative group work based on the materials presented. What is more, many of the more recent, new-generation online materials are highly sophisticated and designed to create the maximum impact. The extensive use of Flash animation, streamed film footage, interactive questionnaires, virtual reality games, and quizzes can add a certain three-dimensionality to what was often static, two-dimensional text with limited visual stimulus.

By integrating web resources into conventional classroom activities, a new world of living language and grammar is opened. The Web offers a never-ending supply of materials which can be adapted and used as the basis of original activities. At all times, we need to ask not so much *what* the Web can do for us, but rather what we can do with the Web (Felix 2001b). Educators can now take advantage of the constantly evolving, almost "organic" nature of the Web by tapping into this limitless resource, and creating environments in which students can learn; teachers engineer a situation, often creating materials from new. Here, we can refer to a process of WELL by design (Levy, 2000). Teachers can begin to move away from pre-packaged, fixed-content courseware towards the creation of task-based activities and web quests where content moves, adapts and changes with the times. In the world of science and technology, this is simply good news.

10 Enabling grammatical notions to emerge naturally through web-based activities

Rather than resorting to the the usual "drill and kill" grammar exercises of old, a better practice model of teaching is one which involves students in relevant, situated activities

1 The University of Padova Language Centre has a licence to use Macromedia authorware for the production of webpages: Dreamweaver MX (with Coursebuilder extension), Fireworks and Flash. The Halfbaked Hotpotatoes Web-authoring suite is also extensively used, as well as OverLIB Javascript for subtitling, designed by Erik Bosrup. Macromedia Flash plugins are used for audio optimization. Audio work is carried out using Soundforge, and files are compressed into MP3 format using Musicmatch freeware; Apple Quicktime mediaplayer combined with Flash is used throughout the site to call up audio and video effectively into a single browser window.

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which then serve to activate and trigger off a number of cognitive faculties in the students. In the Webtask activities section of *Greenspeak* the student encounters various interactive worksheets which focus on specific grammar notions, leading to online writing activities connected to a "submit" button which then posts student contributions electronically to a First Class conference for peer and teacher review.

In *Greenspeak* there is no separate grammar section. Having adopted a more holistic approach to the language learning process, a conscious decision has been made by the author to allow important grammatical notions and language functions to emerge naturally from specially designed Webtask activities: question forms, modal verbs, the language of comparison, sentence patterns and transitions that indicate "cause and effect", verbs of suggestion and advice, future forms, conditionals, phrasal verbs, and the use of nominalisation in scientific discourse are all covered by and incorporated into these activities. Simple explanation tables which demonstrate the forms used in context are inserted at strategic points in the web pages, and the student can incorporate them naturally into functional, CMC activities without mentally separating individual grammatical notions from their real-world context.

11 The creative use of the Web to promote experiential learning through pair-and-group web-based activities.

The future of WELL for specific or scientific purposes centres around a new and creative genre of web activities designed to involve students in experiential learning. Here, according to Felix (2002), learning most definitely becomes an experience rather than a chore. Furthermore, there is an argument for a subject-specific and skills-oriented approach to teaching English for specific purposes, in this case for scientific purposes. As Dlaska (1999) points out, the emphasis is placed at all times on the potential of computer-aided technology in encouraging collaborative learning processes and on exposing science students to subject-specific learning materials.

From reading, to wordbuilding, to listening, to film-viewing, students are now drawn into a totally novel realm where their active participation is given top priority. At this stage of the five-part journey, another journey within a journey is about to unfold. In the Webtask activities section indicated by the "hiking boots" symbol, the learners are encouraged to venture out and explore the Web and bring all their cognitive faculties into play. Each task represents a real-life situation relevant to their specific discipline. In the Webtask activity entitled 'Eco-tourist Adventure', for example, students plan a virtual journey to Brazil and venture deep into the Amazon Rainforest. Departing from a single link they are invited to gather the necessary information from the Web and to manipulate this information to suit the requirements of the assignment.

The component parts of each Webtask activity ensure that the students are involved in real-world settings and in relevant and functional tasks which they could easily encounter in their future lives. By encouraging pair- or groupwork either virtually within a First Class conference, or physically within the "technology classroom", the teacher can offer some guidance to the participants and help them engage in constructive tasks together. Students learn from one another by actively building knowledge together, and benefit from the team spirit fostered. Learning is, without doubt, a constructive process, and Webtask activites are carefully devised and designed in such a

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way as to provide opportunities for such construction. Important communication skills are nurtured in Webtask activities to promote debate and discussion in written CMC activities, as well as pair and group assignments carried out face to face in the "technology classroom". *Greenspeak* encourages a blended learning approach, whereby face-to-face interaction within a traditional classroom setting can be enriched by well-structured CMC andweb conferencing using First Class.

Furthermore, what is particularly encouraging in the current scenario is that a number of collegues at the Padua University Language Centre are using *Greenspeak* and enabling students to include their productions (written, audio and visual) in the "dossier" section of their *European Language Portfolio*. Not only do students actively create their own materials and build on their skills throughout the course, they also keep track of their progress, as well as collect together their classroom materials which clearly document and illustrate their experiences and achievements in both paper and digital format. The importance of the European Language Portfolio in relation to the Common European Framework of reference obviously goes beyond the immediate scope of this paper, but certainly requires further research and more detailed analysis.

Returning to the Webtask activities section of *Greenspeak*: it takes a simple click of the mouse on the hiking boots icon in the main pictorial menu panel for the student to be thrust into the exciting world of web exploration. The following are some examples of constructivist Webtask activities which students can tackle at this stage of their journey of discovery:

- In the Webtask activity entitled "*Pollution Busters*", students are given the necessary language tools to prepare a public speech to explore ways of beating air pollution caused by traffic in their town or city. This speech is to be made before a local council meeting with the Mayor present. Students are encouraged to collaborate with other students online via written CMC in a specially created First Class conference, to make notes of ideas, and glean information from websites which deal with the subject of traffic congestion. Links to video clips of politicians involved in the traffic debate on a specifically chosen BBC web page are provided for extra support and inspiration. Students are then expected to produce a well-scripted speech which can be enacted in class, or recorded and stored as audio files using web-based voice software for synchronous and asynchronous communication creation such as *Wimba*. Investment in this software is currently pending at our particular institution.
- The second Webtask activity entitled "*Create your Own Green Party*" enables students to focus on presentation and debating skills with links to language in use pages which focus on presentation language techniques, as well as explain the dynamics and the organizational structure of a debate. Students have to pool web resources and work together to create and present an environmentally sound political manifesto. Here, they are made aware of the importance of image in political campaigning as they design a new logo for their party, and attempt to make their arguments heard during a political debate. Again, the debate has to be carried out online via CMC in First Class by setting up conferences *for* and *against* the motion, and/or face to face within a traditional classroom setting. The importance of carrying out all the groundwork beforehand by navigating the Web

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needs to be highlighted throughout. Actually filming a live debate can also make for a highly stimulating and engaging classroom experience, but this requires hours of preparation in advance, and a certain amount of rehearsing.

- In the third Webtask activty entitled "*Become an Eco-journalist*", students enter the website of the last International Earth Summit, highlight keywords, take notes, confer with their fellows and pave the way for the creation of an online environmental magazine. This activity could take a number of hours as much research and consolidation work is required, as well as desktop publishing skills. A link to the website of the last Earth Summit is provided, and students are expected to retrieve relevant information, summarize the main stories, and then get together with other students and form a team of eco-journalists. Student contributions in Word format are stored in specifically created conferences in First Class and managed by the students themselves. The teacher intervenes as little as possible during the editing process, but then monitors and corrects grammatical and syntactic errors once the products are completed. Again, the online voice-recording tool *Wimba* can be used by students to create online "radio-style" news bulletins or special reports, and their written contributions could also be inserted into an online environment in the form of a "blog" which requires no prior knowledge of scripted language for the Web.
- The fourth set of Webtask activities enable students to acquire discipline-specific vocabulary and notions associated with climate change. In the "*World Climate Change*" Webtask, students are invited to embark on an amazing journey through our ecosystem. Working with a partner online in First Class, they have to scan the relevant information from the sites provided, and learn about how our climate is changing and how our weather will be affected over the coming century, as well as the effects it will have on our health. In First Class, they are encouraged to take notes, highlight main themes and topic sentences, search for new vocabulary, and summarize their findings in the form of diary entries. The art of summarizing is a skill that needs to be acquired by students from the outset, and is emphasized throughout this section of the website.
- The fifth and final group of Webtasks exposes students to the question of future alternatives, especially as regards alternative energy sources and eco- or "green" living strategies. Students are required to examine and research non-polluting alternatives for transportation and domestic use. They have to imagine they are attending a local council meeting where the mayor is asking those present to put forward ideas concerning alternatives to petrol- and diesel-powered cars. Debating techniques, expressing opinions, brainstorming techniques and role-playing activities are all brought into play here. In the "*Future Car*" Webtask activity, students form teams and have to enter into the role of team-players in the Research & Development department of "*Future Car International*". They are called upon to design and develop a new car for the future, create all the supporting public relations documentation, and present the new model before the class in the form of a simple Powerpoint presentation. Exploration of external sites, acquiring public speaking and presentation techniques, the effective scanning of online materials, and learning to pool together relevant resources form an integral part of this activity.

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12 Encouraging online research into specific terminology for technical glossary creation

An important part of language skills development in ESP is enabling students to build on their specific technical and scientific vocabulary. In *Greenspeak*, the focus is on the language of ecology and environmental conservation. By engaging groups of students in online vocabulary and lexical analyses using a number of excellent, freely available online tools, students can improve their specific language knowledge base. Among the online tools recommended in *Greenspeak* are *VoyCabulary.com*, where each item on a selected HTML page drawn up into this word engine is tagged and linked to the *Websters and Merriam* online dictionary and thesaurus, as well as to audio files. In *Greenspeak*, a number of specially designed word building activities encourage students to navigate to particular sites, to highlight new words and constructions, and look them up in *VoyCabulary.com* before going on to complete a series of interactive activities.

Learning how to use online *concordancing* programmes widely available on the Web is also useful for students who need to become aware of the complexity of specific terminology used in various scientific fields, and in a wide range of *genres* inherent in scientific discourse. In the future, students may be required to read extensively in English for their research, or to manipulate and assimilate highly technical information in their chosen professions, and now is as good a time as any to start using the tools readily available on the Web.

13 Observations on technology-enhanced language learning for science students, and the nature of student feedback

Having using web-enhanced materials as an integral part of my teaching since the late 1990s, notable differences in students' learning performance and general attitudes to learning have been encountered. Undoubtedly, web-enhanced materials stimulate the students' imagination. Students interact with the Web at their own pace without any pressure. They can interact with the materials time and time again, complete activities, and practice pronunciation exercises as many times as they deem necessary. Like Felix (2002), I am convinced that new "technologies have the potential to add value even to the best classroom teaching". The impetus is on motivating learning, a move towards constructing knowledge by the students themselves, not on mouthfeeding them with ready-prepared, fixed content. The Web enables teachers to customize materials and tailor them to the needs of different groups of students. WELL represents a desire to ensure meaningful interaction, to promote connectivity. When the Web is effectively integrated into teaching it adds scope, texture and colour to the method.

During the course of this paper an attempt has been made to highlight the importance in web teaching and educational materials design of placing student needs very much in the foreground. It is also vital for teachers developing such materials to know what the students actually think of the new techniques and technologies being adopted. Students are, after all, at the receiving end of everything teachers do in their work, and without student acknowledgement and active participation in the process the efforts of teachers would be to no avail.

The results of a short, online questionnaire set at the end of an official online examination in January 2003, created using Perception-Questionmark software highlighted a

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number of important factors: firstly, about 80 per cent of a group of 150 first-year science students generally believed that they found using the Web for language learning useful, while almost 50 per cent of students judged web learning not to be useful for listening and pronunciation. According to 52 per cent of students, the Web was most useful for vocabulary learning and glossary building, and again the same proportion (51 per cent) believed that it was useful for improving writing skills. Almost 80 per cent of the students felt that using the Web in class created a more stimulating and thought-provoking lesson. As regards the evaluation by the students of the *Greenspeak* online web project, about 60 per cent of the students actually used the materials regularly to prepare for the end-of-year exam, all the more so because they considered them to be stimulating and pedagogically sound, as well as user-friendly. More than 65 per cent of them agreed that navigation around the site was easy, and that the content and structure was mostly clear and logical. A mere 12 per cent admitted to not having ever accessed the online materials in their own time outside class. A number of students (8 per cent) voiced their concerns about the likely "disappearance" or at least the undervaluing of the teacher in the classroom of the future, while the majority of students in the survey (about 88 per cent overall) preferred a situation in which the Web was within face-to-face teaching in class, the worst-case scenario being distance education without a teacher present.

14 Conclusions

The main advantage of technology-enhanced language learning may be summarised as the fostering of student-centred interaction and learner autonomy on the one hand, and of collaborative learning on the other. As regards the ongoing development of *Greenspeak*, there is a firm belief in providing students with the necessary tools to explore and find information for themselves in the context of a task-based and web-enhanced language course. In the current scenario, it has emerged that WELL is particularly suited to science students grappling with language-specific terminology and often complex new notions in a second language. As soon as the Web becomes an integral part of one's teaching practice, it goes without saying that both on the part of the teacher and the student a whole new world of discovery and mutual learning is opened. Computers certainly have a meaningful role to play in promoting an integrated and more three-dimensional approach to learning which goes beyond the two-dimensional written page. Having tried and tested new teaching techniques in the context of the "technology classroom" at the University of Padova, it must be said that this approach is the way forward in the future.

On saying that, it has to be stressed that teachers and educators will have to acquire the necessary knowhow to keep up with the times. As learning technology changes form, adapts, evolves, becomes more portable, and becomes wireless, teachers devising WELL materials need to constantly update their skills and keep their eyes and ears peeled for new developments and technological innovations.

However, what remains important for the use of new language learning technology is that teachers, while acknowledging and valuing the potential of multimedia web delivery in class, need to maintain a fine balance between what is technically possible and educationally sound. It should never be a case of technology for technology's sake. In order to exploit the full potential of computer-mediated technology, it is essential to involve students in their own learning process, to foster groupwork and individual

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thought, and to set up activities which focus on human interaction and exchange. And finally, WELL is most definitely the way forward in institutionalized language learning programmes, not least of all for specialist language programmes taking place in the various science faculties at our universities.

Note

An extract from the *Sunday Times Magazin*e, 'DOORS: Your guide to the Web'. A special report on children's websites, p. 50, March 31 2002

When you talk to children about their use of the Web (says Neil McLean, Director at Becta – British Educational Communications and Technology Agency) you find they think of themselves as being *inside* something, whereas adults think of themselves as *looking at* something. Children relish the fact they do not merely consume media online, but they can *shape* it too! In the phrase of the moment for children, the Web is not a 'lean-back' medium (eg. watching TV) but a 'lean-forward' medium (eg. eating a meal).

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