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Author(s): ELISABET ARNÓ-MACIÀ

Source: *The Modern Language Journal*, Vol. 96, Focus Issue: Languages for Specific Purposes in the United States in a Global Context: Update on Grosse and Voght (1991) (2012), pp. 89-104

Published by: Wiley on behalf of the National Federation of Modern Language Teachers Associations

Stable URL: <https://www.jstor.org/stable/41478793>

Accessed: 03-10-2019 09:20 UTC

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The Role of Technology in Teaching Languages for Specific Purposes Courses

ELISABET ARNÓ-MACIÀ

Universitat Politècnica de Catalunya

Dept. Projectes d'Enginyeria. Secció d'Anglès

Escola Politècnica Superior d'Enginyeria de Vilanova i la Geltrú

Av. Víctor Balaguer, sn

08800 Vilanova i La Geltrú (Barcelona)

Spain

Email: elisabet.arno@upc.edu

Within the integration of technology into language education, special attention needs to be paid to languages for specific purposes (LSP), drawing on developments in computer-assisted language learning and applied linguistics, on the one hand, and on the pervasive use of technology in academic and professional communication, on the other. From a definition of LSP centered on learner need, specificity of activities and materials, and teacher and learner profiles, this article examines how technology has transformed LSP teaching and learning. Through technology, LSP teachers and researchers can access discipline-specific materials and situations and compile corpora of specialized texts. Computer-mediated communication provides learning tools and a gateway to the discourse community. Technology also provides opportunities for collaborating, creating virtual environments and online courses, and fostering learner autonomy. These applications are examined within the current LSP scenario, paying attention to conditions and challenges for implementation, as well as to the roles of teachers and learners. This article also points to areas that merit further analysis from an LSP perspective, such as the use of different technologies and modes for effective learning, the analysis of specialized texts, and the integration into LSP of emerging technologies that have made their way into social uses.

INFORMATION TECHNOLOGY (IT) PLAYS A crucial role in our society, which is characterized by the increasing internationalization of the personal, academic, and professional domains. In recent years, technological advances have transformed the ways we manage information and communicate with others. The growth of academic and professional communication across borders has generated new needs for learners of languages for specific purposes (LSP). At the same time, technology has also provided LSP teachers and researchers with further opportunities to explore,

analyze, and learn more about professional and academic communication. For many years, IT has also played a key role in language learning, with the development of computer-assisted language learning (CALL) applications and networked environments (e.g., Lafford, 2009).

Drawing on different trends in language teaching and applied linguistics, the applications of technology have attracted the attention of LSP teachers and researchers, with new and hybrid genres, computer tools for gathering and analyzing specialized discourse, and the development of online materials and courses. This interest has been reflected in collections that have addressed the relationship between IT and LSP from different angles, such as a special issue of the journal *Ibérica* on how the Internet has

The Modern Language Journal, 96, Focus Issue, (2012)

DOI: 10.1111/j.1540-4781.2012.01299.x

0026-7902/11/89-104 \$1.50/0

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affected specialized communication and LSP teaching (Posteguillo, 2005), as well as edited books on the role of IT in different areas of LSP research and pedagogy (Arnó, Soler, & Rueda, 2006a) and on the design and implementation of online LSP materials (González-Pueyo, Foz, Jaime, & Luzón, 2009). In addition, the annual conference of the European Association of Languages for Specific Purposes (AELFE) also has a specific panel devoted to IT in LSP teaching and research.

Analysis of the role of IT should start with a definition of the term “languages for specific purposes,” which, in applied linguistics, refers to an approach to language teaching based on the learner’s need to participate effectively in the target academic or professional community. LSP courses are thus cost-effective and rooted in the texts and practices of the target disciplines (e.g., Dudley-Evans & St John, 1998). Some central issues underlying this definition were raised by Grosse and Voght (1991) in their review article, including (a) context, (b) authentic materials and situations, (c) needs analysis, (d) the LSP teacher profile, and (e) cross-cultural and interdisciplinary dimensions of specialized communication. Each of these issues will be dealt with in turn in the remainder of this section, with special emphasis on the profound changes that LSP teaching has undergone in the past 20 years, largely due to the impact of technology. Given this impact, Grosse and Voght (2012) have included technology in the revisited agenda for LSP. This article will take these central issues as the point of departure to analyze the role of technology in teaching and learning LSP.

Grosse and Voght (1991) referred to *context* as one of the distinguishing features of LSP, using the term to mean the use of texts, situations, and methodology drawn from the students’ disciplines. Thus, LSP makes use of authentic materials and simulations to familiarize learners with genuine target situations. Twenty years ago, emphasis was placed on written—and, to a lesser extent, spoken—texts, while simulations involved role plays, with the video and language laboratory as technological resources. This scenario has changed completely, given that the LSP curriculum today must include electronic communication and digital genres (with the new communicative situations they generate), as well as the possibilities that technology offers for accessing authentic materials and engaging in realistic simulations. According to Grosse and Voght (1991), two characteristics of LSP teaching methodology are the use of authentic materials and the creation of opportunities for *situational practice*, which is

relevant to students and, therefore, fosters motivation. Since 1991, technology has greatly contributed to incorporating situational practice into LSP teaching, for example, by facilitating the recording of events such as lectures or meetings—which can be made available online—and by increasing the exposure to authentic materials, via the vast number of resources available on the Internet.

In LSP courses, context, authenticity, and motivation are closely related to the concept of *need*. Grosse and Voght (1991) situated needs analysis at the center of LSP teaching, “since by definition LSP courses are designed around the specific language needs of the learner” (p. 186). Thus, as a key step in course design, needs analysis should involve gathering information about learners’ profiles, the learning situation, and the demands of the target situation (e.g., through discipline-related texts, the views of professionals in the field). LSP methodology makes important demands on the teacher, whose role has evolved from the general language and literature profile described by Grosse and Voght (1991) to a more sophisticated and specialized one. Dudley-Evans and St John (1998) defined the multiple roles for the LSP instructor: teacher, materials provider, researcher, collaborator, and evaluator. In the new millennium, IT has broadened the scope of these roles. Computer networks allow collaboration with fellow LSP teachers and subject matter specialists in remote locations, while the Internet and multimedia resources provide endless possibilities for designing materials suited to learners’ needs.

Another key concept stressed by Grosse and Voght (1991) was the integration of cross-cultural issues in LSP teaching. Among the prospects for the 21st century, Grosse and Voght envisaged specialized communication as interdisciplinary and cross-cultural, driven by economic motivations and a global economy. In this sense, technology has contributed to a shrinking world in ways that were completely unexpected in 1991. Nowadays, with increased mobility and international exchange, academic and professional communication is mostly intercultural in nature. Belz and Thorne (2006) noted the terminological shift from *cross-cultural* to *intercultural*, which is a term that captures the dynamic processes produced both in target settings and in teaching situations, with the powerful impact of IT on facilitating interaction across borders.

This article provides an overview of the role of IT in LSP, taking into account the profiles of teachers and learners, the different settings in which LSP courses are taught, and the

characteristics of the target situations in which students need to communicate. After tracing the historical developments in the field, it explores the main areas in which IT is applied in LSP so as to identify the main opportunities and challenges. Different types of programs are presented with a look at their conditions for implementation and the roles of LSP teachers and learners. Special emphasis is placed on the social and collaborative dimensions of IT in LSP, given that technology allows teachers and learners to engage in partnerships with different stakeholders worldwide (other learners/teachers, discipline experts, professionals, potential employers, etc.). Taking into account the fast-paced evolution of technological applications that are attracting growing interest in the educational arena, this article will identify areas of current concern and topics for further research on the integration of IT in LSP.

HISTORICAL OVERVIEW

The relationship between IT and LSP is heavily influenced by the evolution of CALL alongside developments in applied linguistics and language teaching. CALL is a vast area that has evolved dramatically in the last 20 years, as attested, for example, by *The Modern Language Journal* Focus Issue devoted to CALL. From that issue, it is important to consider Garrett's (2009) definition of CALL as "the full integration of technology into language learning" (p. 719). Going beyond the mere use of technology to teach languages, Garrett (2009) stated that CALL should be based on the interrelation of its different elements: pedagogy, theory, and technology. The evolution of CALL has also been analyzed from the perspective of its underlying learning theories and available technology, with distinctions established by Warschauer and Healey (1998) for the different CALL stages, namely: the *behaviorist* stage (in which the computer had a central role as the provider of controlled activities focusing on accuracy); the *communicative* stage (which focused on meaning and process); and the *integrative* stage (in which the computer served as a tool for online communication, learning, and information management purposes, within a paradigm of learning as a social activity).

Developments in technology and language teaching have brought about concepts such as *network-based language teaching* (Warschauer & Kern, 2000), which involves communication and collaboration, and a *second wave of online learning* (Kern, Ware, & Warschauer, 2004), which goes beyond language learning by focus-

ing on culture and social discourses. Even the very concept of CALL can be extended to embrace other technologies apart from the computer (e.g., mobile devices that can run games, such as *Mentira* [Holden & Sykes, 2011], for place-based language learning) that now form part of our everyday life (Kern, 2006). According to Bax (2003), the integration of technology should aim toward *normalization*, reaching inconspicuousness.

The applications of IT have turned out to be especially appropriate for LSP, given its focus on clearly defined learner needs, materials creation/adaptation, and a methodology that draws on target activities and disciplines. For example, it is quite significant that in a collection of articles specifically devoted to LSP pedagogy (Orr, 1995), special emphasis was placed on the role of IT (then, "new technologies"). One of the articles, by Bowers (1995), identified the potential of the Web to provide tuition for students who had specific needs or who could not attend regular classes due to their study and work situations. In another article, Shilhavy (1995) pointed to the benefits of multimedia packages for integrating English for academic purposes (EAP) skills, in terms of immediate feedback, interaction, and navigation. A third contributor, Vilmi (1995), reported on a pioneering international exchange among English for science and technology students through email. As technology made its way into language classes, LSP teachers used multimedia packages, Web resources, and authoring tools to create specialized materials and promote learners' engagement with relevant target situations.

The Internet has given rise to important changes in language learning, which Warschauer, Shetzer, and Meloni (2000) summarized in the acronym ALIVE, which stands for the concepts of *authenticity*, *literacy*, *interaction*, *vitality*, and *empowerment*. These concepts are especially relevant to LSP learners, who aspire to enter a certain discourse community. Internet resources provide a wealth of authentic materials as well as opportunities to engage in meaningful communication with members of the discourse community (through forums, blogs, etc.). The idea of empowerment for language learners is of particular importance, given that students can publish and disseminate their own texts—even more so today with Web 2.0 applications. Similarly, because of the presence of IT in our everyday life, language teaching needs to consider computer-mediated communication skills in addition to traditional writing and speaking skills (e.g., Chapelle, 2003; Garrett, 2009). Thus, expanded notions of

literacy and communicative competence should now include online communication, collaborative writing, and dealing with hypertext and multimedia (Shetzer & Warschauer, 2000). This concern with new literacies is reflected, for example, in a special issue of *Language Learning & Technology* (Kern, 2000). The growth of the Internet has also called for a reappraisal of traditional EAP skills so as to incorporate issues of critical literacy associated with the use of the Web for study and research (Slaouti, 2002; Stapleton & Helms-Park, 2006).

With the proliferation of resources for online learning, together with the increase of technological resources used in education, LSP teaching can facilitate real-life interaction and engagement with genuine situations, as attested by the examples cited by Belcher (2004). For example, she reported on medical English courses in which students recorded real hospital interactions that were then used as the basis for LSP teaching. The insights offered by IT have led us to reconsider some key concepts in LSP, such as needs, authenticity, specificity, and cost effectiveness (e.g., Dudley-Evans & St John, 1998; Grosse & Voght, 1991). For example, apart from using authentic resources and individualizing learning, course designers may complement face-to-face instruction with online resources to develop cost-effective LSP courses. In this sense, Garrett (2009) noted the potential of technology to address large numbers of students through collaboration between institutions and to offer both support to existing LSP courses and online materials for independent learners—thereby catering to very specific needs and diverse languages—which may be difficult to address through traditional courses.

In relation to the use and teaching of different languages, not only has the Internet reinforced the presence of English as a *lingua franca*, but it has also contributed to the visibility and revitalization of minority languages, precisely because of the relatively low cost of setting up online resources in different languages, and because of the possibility of connecting users through cyberspace (Warschauer, 2001). In Europe, Internet-based projects related to linguistic diversity include Euromosaic,¹ a collection of resources and information on different languages, and the ATLANTIS project (academic training, language acquisition, and new technologies in the information society), which is devoted to the analysis and classification of online learning resources and cultural information about minority languages, such as Catalan

(Strubell & Torres, 2003). Other resources specifically geared to language learning, such as the *e-Tandem* project (<http://www.slf.ruhr-uni-bochum.de/index.html>) with its online learner partnerships, make it possible for virtually any speaker to become a teacher of his or her own language in a globalized learning environment.

APPLICATIONS OF TECHNOLOGY IN LANGUAGES FOR SPECIFIC PURPOSES PEDAGOGY

Technology has provided invaluable tools for LSP, to help us learn about the academic or work situations relevant to students and to provide realistic experience from a socially situated perspective. The affordances of technology facilitate LSP research, “aimed at deeper knowledge of texts and contexts” (Belcher, 2004, p. 178). Technology provides access to authentic texts, tools for their analysis, and online communication resources. It has also become a powerful tool to facilitate students’ immersion in the discourse community. For example, Warschauer (2002a) showed that the Internet can provide a gateway for students to “network” into the academic discourse community through gradual apprenticeship (i.e., using computer-mediated communication for collaboration in the classroom and for further participation in authentic networks within the broader discourse community). Thus, the Internet becomes not only a teaching tool, but also a learning goal, given the pervasive use of online communication in academic and professional communities (see Warschauer, 2002b).

The Internet has also added a new dimension to questions of authenticity and specificity of LSP materials. It provides unlimited access to all types of texts of varied degrees of specialization, which is now accentuated by the current trend toward sharing open access resources. LSP students can therefore engage with online resources related to their discipline, such as authentic academic and professional forums. However, as Garrett (2009) reminded us that the mere use of authentic Web-based resources does not constitute CALL; rather, the true integration of technology involves the challenge of designing appropriate tasks to work with those resources. For example, the EAP textbook by Barahona and Arnó (2001) provided examples of tasks that involved critical skills and language awareness, as students were encouraged to explore discipline-specific resources and evaluate them from a disciplinary/educational point of view, while reflecting explicitly on language and genre features.

From the perspective of LSP and learner characteristics, Arnó, Soler, and Rueda (2006b) identified different areas for the integration of technology: (a) in analyzing specialized language and genres, (b) in online communication, (c) in CALL applications, (d) in distance and blended learning, and (e) in learner autonomy. Based on these areas, the remainder of this section discusses specific IT applications in different LSP contexts, considering some central LSP concerns, such as authenticity (of materials and tasks), specialized resources, induction in relevant discourse communities, and intercultural communication, which are, in turn, interrelated with the main profiles involved in the field, namely, learners, teachers, researchers, institutions, and members of the target discourse communities.

Analyzing Specialized Language and Genres

Technology has provided new insights into the language and genres of different disciplines, thanks to the development of corpora and tools for their analysis. The studies in Arnó et al. (2006a) focused on small specialized corpora for their relevance to particular genres in LSP. In relation to specialized corpora, Flowerdew (1998) compared a corpus of expert texts with learner-produced texts, analyzing how cause-effect relationships are expressed. She suggested that this type of analysis can inform materials designers not only about the features used in target texts, but also about the characteristics of learners' production (i.e., overuse of certain structures, inappropriate markers, etc.). In fact, comparisons between native speaker and learner corpora are attracting interest by developers of EAP writing materials (Guilquin, Granger, & Paquot, 2007). Flowerdew (1998) also suggested that, apart from providing information to materials writers and teachers, corpora can also be incorporated in the classroom as learning tools, provided that they are accompanied by appropriate activities. Several studies have looked specifically at students' use of corpora in the classroom. In the field of EAP, Charles (2007) reported on the use of corpora of theses to develop students' awareness of constructing arguments in academic writing, focusing on the level of discourse. Also in academic writing, Yoon (2008) looked at students' use of a general corpus to develop awareness and autonomy. In addition, Varley (2009) kept track of students' work on projects involving the analysis of general and specialized corpora and provided suggestions for the implementation of corpus use in the classroom. Beyond academic texts, Hafner

and Candlin (2007) reported on the use of a specialized professional corpus by law students working on their writing assignments.

Although most of these corpora involve written texts, greater attention is being paid to spoken genres, especially with resources such as the *Michigan Corpus of Academic Spoken English*, or MICASE (Swales, 2006)—which provides access to a wide range of academic speech events—at the disposal of teachers and researchers. Swales also showed how this corpus can be used to engage EAP students in discourse analysis. Given that technology has transformed the way people communicate, questions may arise as to whether electronic discourse constitutes an evolution from traditional genres or if it has given rise to a set of new genres. Drawing on genre theory, Huckin (2007) argued for the consideration of electronic genres as new genres and for their inclusion in LSP teaching by combining explicit instruction with students' own experience in their use.

Online Communication

Earlier in this article, online communication was identified as part of everyday communication in academic and professional situations. As such, it has become not only a means for language learning but also a goal for LSP students, who must learn to cope with new genres, or *cybergenres* (Shepherd & Watters, 1998). Thus, through participation in online forums, email, Facebook, Twitter, and other digital media, LSP students can engage in authentic discursive practices related to their disciplines in unprecedented ways. In the LSP literature (e.g., Dudley-Evans & St John, 1998; Grosse & Voght, 1991; Hutchinson & Waters, 1987), emphasis is placed on authentic communication and student engagement through meaningful tasks and projects that involve interaction and simulations of real situations. The possibility of interacting with other users worldwide on topics that are relevant to students' disciplines increases motivation and can help students become part of the discourse community (Warschauer, 2002a).

Attention has been paid to the impact of online communication on general language teaching (see, e.g., the review by Chappelle, 2003) as well as on learners' use of new genres (e.g., Abraham & Williams, 2009). Research on online communication within LSP is still scarce but has received increased attention in the past few years, especially as Web 2.0 applications open up new possibilities for users to write, collaborate, and publish. As these new forms of communication have brought

about new genres, new literacies have emerged (Kern, 2006). Focusing specifically on these new literacies, and drawing on the experiences of online EAP students, Rueda, Arnó, and Soler (2007) proposed an explicit focus on electronic EAP literacy skills in order to help students make the most of the Internet for both academic work and language learning, through activities of exploration, reflection, analysis, and interaction (both inside and outside the classroom). For these activities, students use a variety of tools for communication and collaboration, such as classroom forums, external Internet forums, and wikis, within a paradigm based on the notion of electronic literacy mentioned previously (Shetzer & Warschauer, 2000), and they use the Internet as both a learning tool and a target communicative context (see Posteguillo, 2003, for a discussion of *English for Internet Purposes*).

With regard to students' interaction in asynchronous EAP forums, some studies have identified its particular traits, which are distinct from those of face-to-face discussion and academic writing but share some characteristics of both (Hopkins, 2005; Kol & Scholnik, 2008). On the one hand, while participating in the forums, students have time to plan their writing and provide support for their assertions. On the other hand, this writing reflects the dialogic nature of forum interaction, with references to other interlocutors' contributions, questions, or expressed opinions on controversial topics, for example.

Research has also focused on online collaboration through wikis. In her study of collaborative EAP writing, Kuteeva (2011) found that using wikis contributes to students' heightened awareness of audience and genre and greater attention to text organization and form. These findings resonate with interactionist theories applied to online communication, namely, that text-based interaction offers the potential to focus on form and content (Kern, 2006). Regarding focus on form versus focus on meaning in wiki-based writing, a study by Kessler (2009), with nonnative pre-service teachers of English, showed that students tend to focus on content, at the expense of form. Furthermore, students engage in collaboration, which develops their autonomy as they work jointly on the texts, gaining ownership and adapting the wiki space to their own purposes (Kessler & Bikowski, 2010).

CALL

As technology is increasingly integrated in language teaching and learning (as well as in our ev-

eryday lives), the frontier between the face-to-face classroom and CALL becomes more and more blurred (e.g., Neumeier, 2005; van Lier, 2002). Among the areas for the application of technology in LSP, Arnó et al. (2006b) pointed at the potential of CALL not only to improve students' language and literacy skills but also to incorporate sociocultural and collaborative dimensions, in the context of the second wave of online learning (Kern et al., 2004).

Within a framework of integrative CALL, the development of computer-based materials has reinforced and expanded the traditional role of the LSP teacher as a materials designer and provider who deals with authentic, discipline-specific contents and tasks—with the issues of authenticity and specificity being part of the ongoing debates in LSP (e.g., Belcher, 2006; Dudley-Evans & St John, 1998; Hyland, 2002). There are many examples of computer-based LSP materials to suit a variety of purposes and learner needs. Materials range from those dealing with common-core interdisciplinary EAP contents, such as the Web-based learning environment *Quantum LEAP: Learning English for Academic Purposes* (Arnó, Rueda, & Soler, 2009), to discipline-specific materials that recreate students' target academic or professional contexts, such as the Web-based environment *MarEng* (English for Maritime Studies). Developed by different European universities with the collaboration of maritime experts (López de Vergara, 2006), *MarEng* reproduces authentic work situations. Other examples of these materials include the online workshops for nursing and academic writing developed by Hussin (2006) in Australia, or the online game *It's a Deal*, which focuses on intercultural communication through business English simulations (Guillén-Nieto, 2009). Such resources exemplify how LSP materials design takes into account both the stakeholders involved—learners, teachers, discipline experts, potential employers, and, in general, members of the target discourse communities—and the intercultural dimension of specialized communication in global contexts.

Thus, technology provides new opportunities for immersion in real situations, which are becoming more and more realistic in the communities that are emerging in virtual environments. Thorne, Black, and Sykes (2009) classified these environments into *social virtualities* (e.g., *Second Life*), *massively multiplayer online games* (e.g., *World of Warcraft*), and *synthetic immersive environments* (SIE) especially designed for language learners, such as *Croque-landia*, which focuses on Spanish pragmatics. In

their extensive review of the potential of these environments for language learning, Thorne et al. pointed out the opportunities that such communities provide for socialization and real communication practice. Due to their immersive, multimodal, and realistic nature, these environments can facilitate language learning benefits such as greater motivation, participation in real-life tasks, collaboration and negotiation of meaning, and intercultural and pragmatic competence, as well as the development of speaking skills (Deutschmann & Panichi, 2009; Peterson, 2010; Thorne et al., 2009). Such authentic scenarios have great potential for LSP teaching because they enable students to participate in highly realistic settings (e.g., business, medical, educational contexts) or to engage in authentic online communities. For example, the Second Life destination guide (<http://secondlife.com/destinations>) provides links to selected business, educational (e.g., university campuses), or science and technology resources that are present in the virtual world.

Distance and Blended Learning

The development of programs and materials for distance learning, to overcome geographical distance and time constraints, has spurred the creation of a variety of LSP courses and materials. Online learning—whether in distance or blended programs—seems to be especially appropriate for LSP, given that it allows for the customization of learning to suit students' needs, as well as for the provision of highly specialized courses that would not be feasible in traditional classes (see discussion by Garrett, 2009). Interest in online learning for LSP is attested by the different projects presented by González-Pueyo et al. (2009), including both standard learning management systems and dedicated environments. There is a long tradition in the development of online learning materials for LSP (see review by Luzón, 2009), probably out of the need to create materials adapted to specific needs and to offer ample learning opportunities to students who have time and place constraints. Examples of these materials can be found in two projects within the field of health sciences. Mungra's (2009) blended course for medical students in Italy related writing skills to simulated practice, thus providing a relevant context for meaningful work to students who had to fit their courses to their clinical practice. The second project showed how technology can be used for LSP courses in workplace situations that lend themselves to connecting language skills and pro-

fessional knowledge. This project, the blended course *e-Support4U* (Griffith & Nicolls, 2010), addressed practicing nurses in the United Kingdom with the goal of developing their academic writing skills, while encouraging them to reflect on and learn from their professional practice. Technology is thus used to encourage professional reflection, while providing support in academic writing and digital literacy (with tools such as wikis).

Universities specialized in distance education also offer a variety of courses in different languages (e.g., the Open University in the United Kingdom and the Universitat Oberta de Catalunya, in Catalonia, Spain).² Online platforms for distance courses often result from collaboration among institutions, extending beyond a single campus (Garrett, 2009). Apart from such advantages as reaching larger numbers of students, availability, and flexibility, these courses also help students develop their electronic literacies and learner autonomy. These aims, for example, fostered the creation of the online course, *English for Academic Purposes: Learning English Through the Web* (Arnó, Rueda, Soler, & Barahona, 2003), in Catalonia (Spain), through the Intercampus Programme, which, as a result of collaboration among different Catalan universities, provides jointly offered elective distance courses.³ The design of online courses and materials at relatively low cost also offers the possibility of tailoring materials to very specific needs, as shown by Lankamp (2008), who, rather than using or adapting existing online academic writing resources, decided to create a specific online learning environment to help language and literature students write their master's theses.

Blended courses, which combine classroom-based and online tuition, have long been used and seem to be especially appropriate for LSP by providing teaching tailored to students with timetable constraints. Research into optimal conditions for the design and implementation of blended learning in LSP contexts has emphasized the idea that both components—face-to-face and computer-based interactions—need to be carefully planned and integrated. Attention needs to be paid to how the multiple possible combinations can be optimized for effective teaching and learning, a task that entails a reappraisal of the roles of teachers and learners, who must adopt flexible, shifting roles as experts, tutors, collaborators, and so on (Neumeier, 2005). Using Neumeier's characterization of blended learning, Trinder (2009) evaluated a business English course, analyzing how the different components are used to enhance different contents and skills. On the basis of

different parameters applied to the classroom and the online environment (interaction, authenticity of tasks, variety of input sources, learner autonomy, anxiety, feedback, and cognition), she found that combining both modes, with different contents and aims assigned to each, can maximize the learning potential of a course and cater to a wide range of learner profiles. With regard to the effectiveness of online LSP courses, Chen, Belkada, and Okamoto (2004) showed how, by drawing on second language acquisition research, a Web-based EAP course can incorporate both tasks and different modes of interaction together with the possibility of offering learning paths with varying degrees of flexibility. On the evaluative comparison of a distance versus a blended EAP course, Harker and Koutsantoni (2005) concluded that both modes result in similar degrees of student achievement and high levels of satisfaction, although there was a higher dropout rate in the distance course. From the lessons learned, they proposed increasing student support and teacher–student interaction in distance courses.

Learner Autonomy

Learner autonomy has been described throughout this article with regard to the potential of technology for the development of LSP courses and materials that are adapted to specific needs and that, at the same time, allow the learner to make choices and create alternative learning routes. Considering that the LSP learner is characterized by a high level of motivation, technology can help provide appropriate materials and resources to carry out meaningful activities related to specific disciplines. Learner autonomy involves assuming control over one's own learning (Holec, 1981) and is based on the central notions of learner choice and responsibility (van Lier, 1996). Autonomy has become a central issue in language teaching, especially since the developments of technology have facilitated: (a) access to a wide range of authentic materials in different modalities (text, audio, image, video, etc.); (b) the possibility of interaction and exchange with partners worldwide; and (c) a greater degree of learner initiative and control over materials and activities. Thus, the relationship between learner autonomy and information technology has aroused considerable interest in the literature (see, e.g., Benson, 2001; Hurd, 2005; Hurd, Beaven, & Ortega, 2001; White, 2003). Although technology per se does not guarantee autonomy, it can become a facilitator,

as long as appropriate conditions are met, such as providing choices, relevant materials, learner training, reflection, scaffolding, and support.

The relationship between IT and learner autonomy from an LSP perspective has been discussed further by Arnó et al. (2006b) and Luzón (2009). It can be related to constructivist approaches, given that learners can choose appropriate materials at their own pace, thereby building up their own learning routes. In this sense, the hypertextual structure of the Web is in line with these approaches because it provides *connectivity* (i.e., interaction, creativity, collaboration, information exchange) rather than predetermined *content* (Felix, 2002). Along the lines of connectivity, and taking advantage of the wealth of materials available on the Internet, Luzón and González (2006) proposed a set of criteria for developing materials for learner autonomy in LSP that are based on authenticity, motivation, collaboration, integration in the curriculum, learner-centeredness, and strategy development. They suggested that the Webquest⁴ is a particularly appropriate format, both for its relationship to students' intrinsic motivation in discipline-related topics and for the challenge of engaging in authentic open-ended tasks that involve collaboration and problem solving, while providing a scaffolded environment to encourage learning.

Being able to interact with others and contribute to a collective effort is an important aspect of autonomy (White, 2003), which can be referred to as *collaborative autonomy* (Ding, 2005; Kessler & Bikowski, 2010). For example, Ding (2005) describes one British university's virtual self-access center for EAP learners that exploits the potential of the Internet to help students find appropriate learning resources and use computer-mediated communication for interaction with other learners and tutors. As Ding suggested, encouraging collaborative autonomy is difficult in a virtual self-access center, and the challenge that remains is to raise students' awareness of the need to collaborate online.

The objectives of the virtual self-access center reported by Ding (2005) were similar to those of an online EAP course mentioned earlier (English for Academic Purposes: Learning English through the Web), namely, developing learner autonomy and exploiting Internet resources for language learning. In the context of this EAP course, a study was conducted to find out whether and to what extent students were displaying autonomous behavior (Arnó et al., 2003; Soler, Rueda, & Arnó, 2005). Analysis of the students' performance on course tasks showed a variety of actions and attitudes related

to autonomous behavior, such as setting learning objectives, identifying needs, evaluating learning materials and tasks, and reflecting on their own learning process. One question that can be raised is whether students would continue to take responsibility for their own learning after the end of the course.

CHALLENGES TO IMPLEMENTATION AND IMPLICATIONS FOR LANGUAGES FOR SPECIFIC PURPOSES PRACTICE

The previous sections analyzed the impact of technology on LSP teaching and learning and examined the different areas in which it can be used to provide materials and courses suited to learners' specific needs. In the following section, there is a discussion of the opportunities and challenges involved in the use of IT, which, taking into account the particular roles of LSP teachers and learners, will also be discussed in connection with other stakeholders involved in LSP: administrators, international partners, and discipline experts, as well as audiences worldwide. In line with the second wave of online learning mentioned previously, special attention will be paid to the social and collaborative uses of technology in LSP projects.

Roles of LSP Teachers

The reappraisal of the role of the LSP teacher needs to consider ideological and societal stances, both in terms of the use of technology and of the values involved in LSP teaching. Regarding the integration of technology in English-language teaching, Chapelle (2003) examined different trends (uncritical acceptance, reluctance, and taking a middle view) and advocated a "critical, technologically-informed pragmatism" (p. 9). Similarly, within the field of LSP, Arnó et al. (2006b) identified technology as a "double-edged sword," in that the technophile teacher may be fascinated by the mere use of technology, whereas the technophobe teacher may find it difficult to keep pace with these transforming changes and with the new generations of *digital natives* (Prensky, 2001)—those individuals who have always been surrounded by technology so that it is fully integrated in their everyday lives.

The application of IT in LSP practice has affected the multiple roles of the LSP teacher mentioned previously: teacher, materials provider, researcher, collaborator, and evaluator (Dudley-Evans & St John, 1998). The increase of distance and blended courses has extended the role of the LSP teacher beyond the traditional class-

room. From the programs discussed throughout this article, two implications can be derived: First, the role of the teacher involves becoming a course and materials designer who creates meaningful activities that should provide students with guidance; second, the role of the online teacher goes beyond the design of materials and involves active participation (monitoring and supplying feedback and support). These new roles require the integration of multiple skills—in the technological, pedagogic, organizational, and affective dimensions—which, in turn, call for further research and specific training programs (e.g., Compton, 2009; Murphy, Shelley, & Baumann, 2010). Online teaching is becoming more and more common in LSP and may be perceived by institutions as an economical solution to the need to provide tuition to increasing numbers of students. However, this shifting context places important demands on teachers and may lead to contradictory views from the institutional and teaching sides—for example, there may be a large number of students but little teacher support and recognition—which may compromise the quality of teaching (see discussions by Arnó et al., 2006b; Lankamp, 2008).

The projects reviewed in the preceding sections illustrate the convergence of the traditional roles of teacher and materials provider in online LSP teaching. In addition, the Internet, with a growing body of open-access academic and professional content, provides input for developing tailor-made materials and engaging in project-based learning, while enabling students to become familiar with the real discourse and genres of their discipline. These teacher roles are integrated with those of researcher and evaluator, which the incorporation of IT has also transformed (e.g., learning about new discourses and genres, designing, implementing and evaluating IT courses and materials).

The role of collaborator is crucial in a multidisciplinary field such as LSP. Drawing on the traditional collaborative nature of LSP teachers, Arnó et al. (2006b) identified collaboration both among LSP teachers and between the teachers and subject-matter specialists as one of the driving forces for the integration of IT in LSP in order to advance and adapt to a changing context. Butler-Pascoe (2009) also emphasized the potential of collaboration with discipline experts and reported on the potential of technology for authentic projects involving learners' interaction with discipline experts. Most of the technology-based projects reviewed previously are based on collaboration, both among teachers and between the teachers and discipline

experts who can advise on specialist knowledge. Furthermore, within the paradigm of *content* versus *connectivity* discussed earlier, the role of LSP students as providers of content cannot be dismissed.

Roles of LSP Learners

Throughout this article, emphasis has been placed on the profile of LSP learners in terms of needs and motivation, as well as on their role as independent and autonomous learners. As it is for teachers, online learning is not exempt from challenges for learners, for whom self-direction is both a requisite for participation in such courses and a learning goal, for which they need training and support (White, 2003). Apart from the characteristics of distance learners in general (e.g., self-discipline and commitment), distance language learners show certain characteristics that relate to the added difficulty of learning a language without face-to-face contact with a teacher or partners, which is why affective factors become key (Hurd, 2007). In her study on students' reflections, Hurd found that distance language students possessed high levels of commitment and self-awareness and used different types of strategies to manage learning, in spite of their low use of affective strategies. She further suggested that distance language learners should be provided with support, clear instructions and feedback, and structured guidance. In fact, the notions of guidance and structure turn out to be crucial in the effectiveness of online tasks at a distance. For example, in their study of a collaborative e-tandem exchange with LSP students of Spanish and English (in Ireland and Spain), Appel and Gilabert (2006) found that achievement and progress depended on a clearly designed task structured around a meaningful goal, in the context of a task-based approach.

Social and Collaborative Dimensions of Information Technology in Language for Specific Purposes

In this context of international partnership and collaboration through technology, some projects have been developed to promote the use of IT resources to bridge the *digital divide* (i.e., the gap between those who have access to technology and those who do not), with technology as a tool for promoting development. Warschauer (2002b) and Healey (2006) reported on two projects that focused on international collaboration for language teacher education in Egypt and Tunisia, respectively, with a specific LSP focus in the latter. The underlying premise was to equip language teachers with the necessary resources to

allow them to become active agents of innovation in their own contexts.

Computer networks, and the Internet in particular, allow LSP students to engage in genuine intercultural experience through exchange with other participants worldwide in order to develop the necessary awareness and competences for academic and professional communication in international settings. Xing, Wang, and Spencer (2008) reported on the use of e-learning for the development of Chinese students' awareness of cross-cultural rhetorical patterns in academic writing, through peer- and self-reflection encouraged by their electronic collaboration with native speakers of English. Electronic exchange and collaboration offer LSP teachers and students the opportunity to engage in real-life activities similar to those found in today's globalized workplace, which includes electronic communication across borders and with multiple stakeholders. For example, in the field of technical communication, Starke-Meyerling, Duin, and Palvetzian (2007) advocated a method to adapt teaching to this reality, through the design of *globally networked learning environments*. Explicitly ascribed to this trend, two technology-based projects have promoted exchange and collaboration between students in Europe and the United States. In the first project, technical communication students collaborated on the online peer editing of their texts (Anderson, Bergman, Bradley, Gustafsson, & Matzke, 2010) and, in the second project, the Trans-Atlantic Project, there was collaboration between students of translation and students of technical writing, with a focus on cross-linguistic issues (Maylath, Vandepitte, & Moustien, 2008).

Apart from enabling students to access information and collaborate with partners at remote locations, technology can also be used to challenge and modify students' views of learning. Devaux, Otterbach, and Cheng (2006) used Internet resources with Asian students of English for specific purposes to instill in them a view of the language learner as an active participant who takes responsibility for the learning process, thus responding to one of the main challenges in current LSP teaching: to prepare students for work and study in a rapidly changing globalized society. From a similar perspective, Thang and Bidmeshki (2010) also stressed the potential of online courses for learner training and support. From their analysis of Asian students' perceptions of an online English for science and technology course, they pointed out the importance of adopting a notion of autonomy that is flexible enough to be embraced by students from different cultures

and that promotes the development of skills for progressive autonomous behavior, while taking into account the preferences of some students for direct teacher guidance.

In addition, in relation to the social dimension of technology use, it is important to consider the potential of the Internet for increasing the visibility of different languages, as mentioned earlier in this article. On this topic, Garrett (2009) pointed out that technology may allow the development of teaching materials and resources for less commonly taught languages (LCTLs) and for heritage speakers (i.e., speakers whose family language is different from that used in their environment, and who may have varying degrees of proficiency in it). Garrett further established some parallels between heritage language speakers and LSP students: (a) some heritage speakers may have needs similar to those of certain LSP students, especially those who need to develop academic skills; and (b) because of the relatively small numbers of students, it may not be feasible to set up regular courses for some highly specific LSP groups, heritage learners, and learners of an LCTL. Therefore, technology may help provide online learning environments and collections of multimodal texts (audio, visual, textual) for learners to access, as well as shared resources extending beyond single institutions. Examples of IT resources in the United States for LCTLs and heritage speakers can be found in Garrett (2009).

Blake and Zyzic (2003) studied online communication exchanges between learners of Spanish and heritage speakers of Spanish. They suggested that because of their specific characteristics, heritage speakers can provide a useful resource from the perspective of language acquisition, bringing together, on the one hand, the benefits of native speaker–nonnative speaker interaction and learner–learner interaction and, on the other hand, the affordances of online communication in terms of availability, planning, and reduced anxiety. Further research on the use of technology with heritage speakers has shown, for example, how heritage Korean learners—proficient in conversation, but not in formal registers—use the Internet to enter the discourse of Korean-based communities, engaging in authentic communication and developing their linguistic and cultural knowledge, together with their digital literacy (Sook Lee, 2006). In addition, the development of dedicated Web-based environments, common in mainstream LSP, can also be useful for learners of LCTLs and heritage speakers, as attested, for example, by the work of Kourtis-Kazoullis (2008) on an online environment for the learning of academic skills in Greek.

CURRENT NEEDS AND PRIORITIES

Because of the pervasive influence of IT as a tool for learning and for actual academic and professional communication practices, the integration of technology in LSP deserves special attention. Taking into account both the definition of LSP, as teaching based on clearly identified needs, and the affordances and challenges that technology brings into the teaching/learning context, it is necessary to identify priority areas that should be specifically addressed. These areas include the following: (a) incorporating emerging technologies, (b) developing IT-based teaching projects grounded on a clear rationale, (c) training LSP teachers and learners, (d) designing courses and materials rooted in socially situated international practices, and (e) setting a research agenda linked to current LSP teaching.

One of the challenges for LSP teachers is the need to keep pace with students' technological skills (Arnó et al., 2006b), especially in the case of younger students who are digital natives (Prensky, 2001). However, rather than regarding themselves as *digital immigrants* (i.e., newcomers to the latest technologies), LSP teachers can help students make the most of the emerging technologies at which students are already adept, as a point of departure to maximize their opportunities for language learning, especially now that the digital divide goes beyond mere access to technology. In this sense, Vie (2008) proposed the concept of *digital divide 2.0*, to refer to the fact that despite their familiarity with such technologies, young students may lack critical literacy skills for their effective use. She suggested that teachers should integrate these technologies into their classes for critical literacy development. Similarly, Murray, Hourigan, and Jeanneau (2007) showed how blogging can be used to develop students' academic writing skills, and the previously mentioned study by Kuteeva (2011) related the use of wikis to academic writing concerns. Although Web 2.0 applications and social networking are relatively new in mainstream language teaching, in the field of LSP they resonate with earlier Internet practices, given that many LSP students, as members of their discourse communities, already have experience participating in specialized Internet forums, discussion lists, and newsgroups to exchange information about their discipline. New technological applications have further expanded the possibilities for learners' immersion in and authentic interaction with specialized online communities.

This article has reviewed a variety of technology-based projects for different LSP contexts. Given

the rapid advances in technology and the dynamic nature of globalized academic and professional settings, one of the challenges in LSP is to develop IT-based projects that are effective and grounded on a sound rationale. On this subject, Kennedy and Levy (2009) pointed out that approaching long-term CALL projects may appear incompatible with the fast-paced evolution of technology, but suggested that rather than being concerned with implementing the latest technology, it is important to devise projects that are technologically robust and have a sound pedagogic rationale. These authors discussed the question of sustainability in CALL (i.e., they evaluated the implementation of long-term IT projects both for LSP and general language learning). Among the key factors for success they identified were (a) the tailoring of projects to specific learning needs; (b) the lecturers' skills; (c) the teamwork of participants involved in the project (d) the sound integration of a technological and pedagogic rationale; and (e) the development of projects through a cyclical process of experimentation, evaluation, and improvement.

Another key aspect that emerges from the use of technology in LSP teaching is the training of teachers and learners, which involves preparing teachers for the effective integration of the technologies that students already use, as well as training learners to make the most of technology for successful participation in the academic and professional communities. In relation to this point, technology provides access to authentic discipline-specific materials and opportunities for genuine interaction, so that now, more than ever, LSP teachers can design courses and materials tailored to specific, realistic needs by drawing on actual practices in the target settings. Thus, through exchanges or partnerships that extend across borders, students can be exposed to the challenges they will encounter in globalized academic and professional contexts. These approaches can help bridge the gap between the LSP classroom and workplace demands, which involve collaboration and communication with different types of stakeholders and require a special focus on intercultural communication.

With LSP teaching and research being closely interrelated, it is necessary to set a research agenda related to the use of technology in current LSP teaching in order to evaluate the effectiveness of IT-based LSP teaching projects. In this area, special attention has been paid to the use of different technologies and modes (i.e., distance, blended, face to face) for LSP teaching. Another important area of research relates to the investigation

of the characteristics of the specialized communication in which students will be expected to engage. In this sense, the main focus still remains on the analysis of written discourse, although there is an increased interest in the spoken language. Further research should be devoted to the development of spoken skills and the analysis of spoken texts in LSP. Given the increasing use of electronic communication in academic and professional settings, further research should be devoted both to the analysis of electronic texts (see Bowles, 2012) and to the development of students' electronic literacy skills.

Research into IT in LSP also needs to keep pace with technological advances and their social uses. In this sense, as mobile devices are making their way into language teaching, more research is needed on their use and effectiveness—see, for example, Rosell-Aguilar (2007) on podcasting and Stockwell (2010) on mobile phones—and further research should focus specifically on LSP contexts. Because of their special relevance to LSP, attention should also be paid to Web 2.0 applications, examining their relationship to some of the key concepts in LSP, such as discourse community, genre, authenticity, and the role of discipline knowledge.

CONCLUSIONS

This article has reflected on how technology is integrated into LSP teaching by considering key notions in LSP pedagogy raised by Grosse and Voght in 1991, such as context, needs analysis, authenticity, teacher roles, collaboration, and specificity of materials and courses. A wide-ranging approach to technological applications has been presented, based on their integration within a sound pedagogic framework, including both older and newer technologies.

In relation to LSP teaching, technology provides us with the opportunity to deal with different languages (and across languages) and to design activities for a variety of learning contexts, preparing students to deal with specific target needs, thus integrating target community practices into the LSP classroom. Using technology as a gateway to the discourse community allows teachers and learners to bridge the gap between the learning situation and professional contexts by engaging in genuine interaction and collaboration with other learners, teachers, discipline experts, and professionals/students worldwide.

Interconnected courses and materials open up new perspectives for LSP teaching in unprecedented ways: sharing knowledge and views in the

open arena through networked resources and forums; obtaining discipline-specific input from different sources; and integrating emerging technologies into social, learning, and professional practices.

To face the demands of globalized workplace and educational settings, it is necessary to help LSP students develop their capacity for intercultural communication, critical reflection, and learner autonomy. By creating new learning opportunities—accompanied by research into their effectiveness—LSP teachers will be better equipped to support students to make the most of technology for independent, lifelong learning, a crucial skill for students and professionals who must adapt to rapidly changing environments.

In their 1991 article, Grosse and Voght identified technological innovation as part of the agenda for LSP. However, 20 years ago one could hardly imagine the extent to which information technology would shape language learning and communication in general and LSP in particular. As a result of the enormous social and technological changes of the past 20 years, LSP teachers are faced with the challenge of making the most of technology to help students develop the communication, literacy, critical, and technological skills that they will need to work and study in international contexts.

ACKNOWLEDGMENTS

I thank Barbara Lafford and Leo van Lier for giving me the opportunity to contribute to this volume as well as for their guidance and useful feedback during the process. I am especially indebted to Barbara for her patient and careful reading of an earlier version of this article. Thanks are also due to three anonymous reviewers for their insightful suggestions.

NOTES

¹See the Web site of the Euromosaic project: <http://www.uoc.edu/euromosaic/>

²See information and language course listings on the Web sites of the Open University (UK), <http://www3.open.ac.uk/study/undergraduate/languages/index.htm>, and the UOC (Catalonia, Spain), <http://www.uoc.edu>

³For general information on the Intercampus Programme, see <http://www.catcampus.org>

⁴Originally developed by B. Dodge at the University of San Diego in 1995, <http://webquest.org>

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