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Creating a computer-based language learning environement

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Abstract

This paper considers key questions concerning computer-based language-learning environments. Using evidence from current literature, it discusses the main characteristics of such environments including human, technical and physical resources, communicative structures, information management, and cultural contexts. It then uses data from an investigation of the universities of Cambridge, Toronto and Ulster to assess the pedagogical effectiveness of the computer-based environments currently in operation in these three institutions.

It considers, in particular, the integrative role that computer-based language learning environments seem to provide. Although each institution has integrated computer technology into language teaching and learning in different ways, a key element of each environment has been the establishment of a common computer-mediated infrastructure, enabling effective information dissemination, resource distribution, communication and teaching and learning. No single common infrastructure would be suitable in all three, however, in each case, it was found that the environments created were valuable, especially in integrating elements of the teaching and learning process that would normally have remained apart.

In concluding that the creation of a computer-based language learning environment in the present climate is beneficial, it was noted that adequate technical resources and a management that is keen to integrate computer technology into all aspects of university life is a key factor in their success.

1 Introduction

In considering the creation of a computer-based language-learning environment, two key questions need to be addressed. What characteristics would such an environment have? And how does such an environment work in integrating teaching and learning?

2 The learning environment

2.1 General characteristics

Clearly, whatever the subject, there are a number of generic components of any learning environment. They are:

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a. *Physical resources:* Classrooms, laboratory space, libraries and academic offices
b. *Technological resources:* The provision of up-to-date computers.
c. *Communication:* The management of information and its transmission to all involved in the learning process.
d. *Human resources:* Staff who are trained to teach students and eager to adopt new methods and technologies. Significant technical support not only for the maintenance of hardware but the development of teaching materials is also required.
e. *Pedagogical strategies:* Teaching strategies need to be drawn up and related to the delivery of the curriculum.
f. *Cultural context:* The approach to learning adopted by staff and students.

2.2 What is a computer-based learning environment?

Thinking particularly about a computer-based learning environment, Michael Hannafin and Susan Land's definition (1997: 194), suggests that there four main elements to such a learning environment. They are: tools, resources, people and design. This definition supports our taxonomy of general characteristics listed above. In such an environment, computer technology is used to provide access to learning resources, through the Web, for example. In addition, the computer is used as a tool (as a means of presenting and distributing information). Computer technology can also be employed to enable staff-student communication, through Computer Mediated Communication (CMC) packages. Finally, and perhaps most significantly, a computer-based environment needs to be carefully constructed in order to ensure that all the other components are effectively integrated into it. It is important to ensure that the uses of computer technology in this type of environment are not seen as separate, but rather that they are integrated, working together to enhance the process of teaching and learning. This supports Levy (1997: 231) who argues that CALL packages must not be seen as stand-alone creations.

In this context, Virtual Learning Environments (VLEs) enable effective communication and instant access to resources and tools within a common framework. However there are crucial differences between VLEs and computer-based learning environments. A Virtual Learning Environment is essentially a tool used to facilitate the delivery of teaching and to support learning. However a computer-based environment has a wider role. In this type of environment, the technology is used to integrate learning and teaching methods with resources and, most importantly, the users (students and teachers). Since the main purpose of such an environment is to facilitate learning, this means that technology need not be used at all costs. If other more conventional teaching and learning methods work well, then there is little point in using computer technology. As a result, in a computer-based environment, the technology is not the sole factor. Instead, the technology is used to enhance already existing effective teaching methods for the benefit of learners and teachers. The concept of pedagogy-driven as opposed to technology-driven use was very clearly presented at the 2002 EUROCALL conference in Jyväskylä, Finland. One example was Uschi Felix's keynote paper, "Teaching languages online – Deconstructing the myths". See Tankó's conference report (2002: 326).

Evaluating the extent to which computer technology is integrated into each of the elements of a learning environment helps us to consider whether the type of computer-based environment discussed in this paper is a reality or just speculation. We will

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consider computer-based language-learning environments under the following headings: Learning and Teaching Resources, Communication, Pedagogical Strategies and Infrastructural Strategies.

3 Methodology

In order to assess whether computer-based language-learning environments have been successfully created, data was gathered from languages departments in three separate institutions: the universities of Cambridge, Toronto and Ulster. This study, concentrating on the theme of integration, is part of a wider PhD investigation into computer-based language-learning environments, which has been documented elsewhere (Gillespie & Barr, 2002: 121). In this paper, much of the evidence cited is drawn from qualitative analysis. Where appropriate, however, evidence has been deployed from the findings of 66 staff and 218 student questionnaires.

4 Learning and teaching resources

Resource provision varies in every university, depending on financial and human resource constraints. It was hardly surprising to note, therefore, that the way in which computer technology was used to provide language learning and teaching resources varied throughout the three institutions.

4.1 Cambridge

Here, computer technology is used to provide a bank of pedagogical resources. In 1996, the Faculty of Modern and Medieval Languages (MML) installed a CALL facility, containing almost thirty multimedia PCs. The computers offer a range of networked CALL programs for twelve languages. The facility is used for both teaching and private study. Questionnaire evidence shows, however, that 38% of staff (N=42) and 46% of students (N=82) use the CALL Facility for teaching and learning, indicating that the installation is far from overused. One of the main reasons for this is the perception that CALL does not fit the Cambridge curriculum and that its use is therefore not essential.

Cambridge also provides networked access to CALL resources, allowing students access to programs and material from their college bedroom. While this provides more flexible access to electronic learning resources, many students are often unaware of its existence or are unable to make the necessary technical configuration changes to their own computers to gain access to the CALL resources. Clearly, this raises the issue of training and shows that students need to be shown what resources and facilities are available to them.

Aside from networked CALL resources, a limited range of web-based resources is provided. Most of the web-based resources are available in the departments of Spanish and Portuguese, and Russian, where course websites have been created. The websites are used to disseminate information, such as lecture notes and information about classes, as well as some CALL exercises. Although limited, most of the web-based resources available to students are clearly structured within a web gateway. The provision of such a gateway enables students to find web pages and other web-based resources with

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greater ease and avoids the type of unstructured approach to web searching that Bel and Ingraham warned against in their paper on the potential of the Internet in language learning and teaching (1997: 108).

4.2 Toronto

Resources in this institution are much more extensive, with six multimedia labs available on two campuses, providing access to over 150 PCs. These labs are used quite extensively, with 77% of staff (N=13) and 59% of students (N=64) using them for language teaching and learning activities. These figures suggest that there is a more widespread perception here that CALL activities fit into the language learning and teaching process.

In addition to the provision of multimedia labs, a vast bank of web-based material is available for learning and teaching purposes. Most courses of study, at least in French, provide course websites. These websites provide on-line language learning exercises, such as grammar quizzes, aural comprehension exercises and phonetics tests, in addition to lecture notes and other course administration details. In general, most of the material available at Toronto is web-based, with very few locally networked language learning resources.

4.3 Ulster

Resources in this institution are more limited. Multimedia CALL labs were only installed on the Coleraine and Magee campuses at the beginning of the 2002/03 academic year. The absence of a dedicated CALL facility up to that point might also explain why such software has not been widely used in teaching and learning. 11% of students (N=72) and 8% of staff (N=13) have used CALL software. However, students and staff have used a range of web-based language-learning resources using locally developed gateways for four languages extensively. The most recent of these has been the grammar diagnostic tests created on *WebCT*. The University has also made widespread use of the *FirstClass* conferencing package for disseminating information such as lecture notes. For a more detailed discussion of the use of *FirstClass* at the University of Ulster, see Gillespie (2000: 19-26).

5 Communication

Although the use of electronic language learning and teaching resources varies across the three institutions studied, it is significant that computer technology is widely used for communication purposes. In fact, computer-mediated communication is a way of life in all three universities and fulfils an important integrating function.

5.1 Cambridge

Staff and students are based in different colleges across the city. This makes face-to-face communication a time consuming task and, as a result, the MML Faculty has adopted e-mail as its main form of communication, replacing the need to circulate information

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using noticeboards or through the post. In fact, the MML Faculty recommends that all students consult their e-mail at least twice a day. Questionnaire responses indicate that 96% of students and 95% of staff use e-mail regularly to communicate with each other.

One reason why e-mail usage is so widespread is that students have excellent access to e-mail facilities. Many colleges provide networking connections in their bedrooms, thus allowing students with their own PCs or laptops to connect to the Internet and to check their e-mail several times each day. This finding is supported by questionnaire evidence, which found that 59% of students (N=42) had Internet access in their college bedrooms.

5.2 Toronto

The use of electronic communication in this institution is vital since staff and students are spread across the city. The use of e-mail among staff and students is not as extensive as in Cambridge. 77% of staff and 59% of students use it for communicating with each other. Most communication takes place through course websites and web-based bulletin boards. The main reason for using these systems is that e-mail provision within the University of Toronto has generally been quite unsystematic. In Cambridge, on the other hand, e-mail addresses are allocated centrally, and electronic distribution lists are created at faculty and department level. In Toronto, students are responsible for activating their own e-mail accounts, which makes it very difficult for central administration to create distribution lists at the start of the academic year. Given the vast numbers of students taking languages courses in Toronto, the importance of accurate distribution lists is evident. However, since such accuracy is not guaranteed, e-mail is not seen as the most effective form of staff-student communication. On the other hand, a web-based system, such as a bulletin board, does not involve extensive set-up procedures and allows information to be disseminated to vast numbers of students with great ease.

5.3 Ulster

Unlike the other institutions, students at Ulster do not have good access to the Internet off-campus. Most tend to live in privately owned accommodation, as opposed to halls of residence, or travel from home. Internet connections in flats or private houses are rare. Even those students who live in university accommodation do not currently have network connections in their bedrooms (according to student questionnaire results, 6% have Internet access from their term-time accommodation). Despite this, however, computer-mediated communication is widespread. *FirstClass* is used extensively by staff and students (in a separately administered questionnaire, 90% of staff, where N=6, and 84% of students where N=43, admitted using it for mainstream learning and teaching tasks). The endorsement of *FirstClass* does not mean that e-mail is not used. In fact, 92% of staff (N=13) use e-mail regularly, especially to communicate with their colleagues. Despite the limitations of access, electronic communication at Ulster is seen as more effective and flexible than other more traditional forms of communication.

In all three cases, electronic communication, whether through the Web or through e-mail, is widely endorsed, because it enhances the learning and teaching experience. In all cases, it enables fast, effective communication, sometimes with large groups of

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students (as in Toronto) and enables various learning activities to be integrated in a way that would not be possible using other means. Other forms of communication, such as lists and posters on notice boards, simply would not have the same effect. As a result, this use of technology is being driven by pedagogical rather than technological considerations.

6 Pedagogical strategies

While all three institutions use computer technology to provide learning and teaching resources and to facilitate staff and student communication, this does not, of itself, guarantee that a computer-based learning environment exists in each one. In addition to providing the necessary technological infrastructure, environmental strategies need careful planning. These fall into two main categories: curricular and infrastructural.

6.1 Curricular strategies

In each institution, careful thought is required to plan the use of computer technology in learning and teaching. It is important to plan the integration of electronic communication and computer-based resources into the modern languages curriculum to ensure that the facilities are used extensively and, more importantly, that students and staff perceive some benefit from using them.

6.1.1 Integration of CALL

Both Cambridge and Toronto have extensive multimedia CALL facilities, although those in Cambridge are underused in comparison to Toronto. Why?

CALL is an essential part of modern language studies in Toronto. Departments, such as French, have developed a range of on-line language learning exercises and resources that students use each week in class. Outside class, Toronto students are encouraged to use the facilities for self-study. Furthermore, participation coursework marks are awarded to those students who use CALL material in this way. In Cambridge, course evaluation procedures (most courses are assessed entirely through sessional examinations) mean that many CALL resources are used solely for self-study or for examination revision. Examples of these include banks of previous listening comprehension tests and translations prepared on *TransIT Tiger*. Students generally do not have regular weekly classes that require them to use language-learning packages.

At Ulster, recent efforts to integrate CALL have been encouraging. During the 2001/02 academic year, the grammar diagnostic tests created on WebCT were completed by first and final year students on two modern languages courses. The results from these tests were analysed and given to course tutors with responsibility for grammar teaching. These tutors, in turn, used the results and analysis to alter the content of grammar classes and, in certain cases, provide remedial teaching.

6.1.2 Creation of an e-culture

The integration of computer technology is also dependent on whether or not computer

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technology is considered to be a natural part of the teaching and learning experience. This has been achieved in a number of ways, especially at the Universities of Toronto and Ulster.

Some courses in Toronto are now taught through the medium of the computer. These web-based modules (currently only available in the department of French) require students to research, prepare and submit coursework assignments on-line. For these courses, if the computer were not used, the assignments would take longer to complete. A similar type of model is used at the University of Ulster, where students in some courses are required to submit coursework electronically, normally through *FirstClass*. As a result, many students use *FirstClass* as their main source of contact with staff, which, in turn, has led to some of the less enthusiastic users of the system among the academic staff to use it. In fact, many now depend on the system so much that if it crashes or if staff do not post lecture notes onto the *FirstClass* system, students complain vociferously.

Students in both these institutions are encouraged to use the Web to research essay and coursework topics, more than students in Cambridge. Questionnaire results show that 77% of staff in Toronto and 85% in Ulster (compared with 55% in Cambridge) encourage students to use the Web in this way. At Ulster, for example recommended reading lists now come with a list of URLs as standard. Creating a dependency on the Web, of course, can be counter-productive and some students will simply not use other sources of information such as library books and journals. This problem highlights the need for educating students in the advantages and pitfalls of the Web so that they understand it is not a panacea for research.

In the Universities of Ulster and Toronto, there is evidence of a wider e-culture. In both institutions, computer technology is extensively integrated into other aspects of university life. They provide a web-based information system that allows students to enrol for modules and courses on-line and to access examination details. Furthermore, both institutions offer a comprehensive electronic system that allows staff and students to reserve books on-line and to access a wide range of electronic journals, books and other reference material. In Cambridge, a more limited range of on-line student management facilities is available, but these are improving continually. In any case, this type of system means that staff and students need to use computer technology for everyday tasks. In fact, using the computer for such tasks becomes instinctive. Creating such a culture is perhaps one way of addressing the types of psychological and social resistance that Gillespie and McKee consider to be some of the main obstacles towards the integration of ICT into teaching and learning (1999: 40-41).

7 Infrastructural strategies

These strategies take two main forms: the provision of human resources and the creation of a coherent interactive computer-based infrastructure.

7.1 Human resources

The three institutions each provide adequate technical facilities but each one requires dedicated staff to coordinate and ensure their use and integration into the teaching and

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learning process. The provision of such staff varies across the universities.

In Toronto, a very comprehensive staffing structure is available to coordinate the use of computer technology. Three years ago a director was appointed to run the multimedia labs. Furthermore, the director employs students on a casual basis to digitise audiovisual clips and assist in the preparation of courseware. A dedicated webmaster maintains the course websites for each department. For those academic staff who want to create their own material, they can call upon the expertise of technicians from the Computers in Humanities and Social Sciences Service (CHASS). They also have access to a state-of-the-art multimedia Web publishing suite in the main University library. This comprehensive network of human resources allows for courseware to be developed quickly and at short notice. In other words, web-based resources and exercises can be developed almost as quickly as other forms of pedagogical material.

In Cambridge, there are fewer staff dedicated to developing and preparing courseware and maintaining facilities. Most of the responsibility lies with the Faculty CALL Officer, assisted by a dedicated technician. Support is also provided from technicians in the Language Centre (who assist academic staff, in particular, with the digitisation of audiovisual material). Since there are fewer dedicated staff in Cambridge, there are more demands on their time. As a result, courseware development is not always as rapid as staff would like it to be.

Ulster, at present, lacks human resources in this area. Aside from three faculty technicians, (who are responsible for the technical needs of the Faculty of Arts), most of the courseware development is undertaken by one or two members of staff. Until recently, this lack of human resources was not particularly problematic. The installation of multimedia labs for languages, however, will require extensive courseware development and this may lead to the appointment of dedicated staff. Such a decision would also further the development of the University's computer-based language-learning environment.

7.2 Computer infrastructure

Perhaps the most important factor in establishing a computer-based environment is to ensure that it is accessible to the maximum number of users possible. There are various ways of doing so and each of the case study institutions adopted different approaches. The University of Toronto uses the Web to provide students and staff with access to resources and communication facilities. Cambridge used its local network for the same purpose, while Ulster has adopted a web-based intranet (through *FirstClass* and *WebCT*) for this purpose. In each case, the infrastructure adopted has its merits and drawbacks, although it appears that a web-based model ensures maximum access to resources and facilities. On the other hand, an open access Web environment is not the most secure, and staff in Toronto have been unable to make available certain locally-networked CALL applications, such as CD-ROM dictionaries, on the Web. This type of problem, however, can be overcome by using a VLE, where it is possible to access locally-networked applications through authenticated user accounts. During the academic year 2002/03 at Ulster, CD-ROM dictionaries should become available to students through their *WebCT* accounts.

It is clear, however, that whatever approach is adopted, a computer infrastructure offers two key benefits that assist integration:

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1. It links together elements of a learning environment, such as communication tools and pedagogical resources within a common interactive framework. In other words, students can use all these facilities from one location. Students do not want to (and often do not have the time to) travel long distances to use CALL facilities and then go to another lab to type up work or check e-mail, for example.
2. A common infrastructure, whether web-based or not, gives students flexible access to facilities, either from a college or residence bedroom or from home at times most convenient to them. They are not restricted by lab opening hours and, in addition, they can use the facilities for as little or as much time as they want or need to.

8 Evaluation

What becomes clear is that the integration of all the elements of a computer-based language-learning environment is crucial for it to operate properly.

8.1 Communication

As we have seen in the three institutions, a key element of this integration is communication between students and staff, which has become part of the culture. Without that communication (by Web and e-mail), it is hard to see how such an environment could operate. A communications network enables teaching and learning activities to be integrated with classes, and for instance with the production of work.

8.2 Pedagogical strategies

However it takes more than just communication. It is important that computer-based activities are not used for their own sake, or to justify the purchase of the equipment, but they are an integral part of the pedagogical strategies of the appropriate institution. For instance they need to be integral to the curriculum and to the assessment process, something lacking, for example, in Cambridge. When they are, staff and student reactions are generally positive. For example, performance in project work has been enhanced by the use of the Web, and work on *WebCT*-based diagnostic tests has been valuable in gauging student achievement.

It would appear that language learning benefits especially from using a computer-based environment, since communication in writing and in speech across boundaries is central to it. The kind of manipulation that language work requires is well served by the use of computers and the multiple modes of activity and range of skills that need to be adopted fit in well with the multimedia possibilities of new technologies. Moreover the internationalisation possible through the use of the Internet and in particular the Web and the access to on-line TV and radio means that languages can benefit particularly from these new environments.

It takes time, however, to develop clear pedagogical strategies for the use of computer environments. Such development is occurring in each of the three institutions, but there is some way to go. Progress is being inhibited by a lack of staffing, both support staff and technical staff. While this is nothing new in academia, such staff are particularly important in this area, especially for the production of new materials.

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8.3 Infrastructural strategies

Infrastructural integration is also important. There need to be enough computer and other resources to develop a viable intranet. It is clear that, without a sound operational infrastructure, the computer-based language-learning environment will be ineffective. Our study has shown that when there is limited, incomplete or inadequate equipment students react negatively. Other inhibiting factors include untrained, uninvolved or uninformed staff, which we have considered elsewhere (Gillespie & Barr, 2002: 121).

In the institutions concerned, these do not appear to be significant problems. Each of the three institutions studied is successful because such resources are available. This effect is enhanced when the whole university environment is computer-based. Using computers for taking books from the library, enrolling on courses, accessing management information and so on develops the computer environment and further extends it. It not only improves the level of technical support available, but also embeds computer-related behaviour in the minds of students and staff. A university-wide computer environment also ensures a sufficient critical mass of student and staff participation, which enables a computer-based language-learning environment to work effectively.

All learning environments are complex, but computer-based language-learning environments are particularly complex, so co-ordination is vital. We have found that the most successful integration of environments has occurred when there has been high-level management support for the development of such environments, not only in providing the finance, but also in shaping the direction and motivation of the system. With the current emphasis on e-learning and computer competence, this kind of support is increasingly forthcoming and is present to varying degrees in the three institutions considered.

Of course nothing stands still in the area of technology and communication, and the systems need to be self-transforming. Each of the three environments we have studied permits new developments to be integrated into the current systems.

9 Conclusion

We have seen what the characteristics of computer-based language-learning environments are, and have shown that three different environments have been successfully created. It is clear that their effective operation and their potential far outweigh the challenges of establishing them.

It is also clear that computer-based language-learning environments are valuable because of their integrative function. They serve to integrate a wide range of people and activities within the teaching and learning process, not just for communication purposes, but also in teaching and learning activities within the curriculum and in bringing together a wide range of functions and resources, both academic and administrative.

Looking at the three institutions and their success so far, it is possible to point to three different computer-based language-learning environments that are functioning effectively. Each has its strengths and weaknesses and there are many areas that could be enhanced, but it is clear that important advances have been made. Each institution is very different, but the effectiveness of the learning environment does not seem to depend on whether the institution is old or new, rich or poor, collegial or unitary. The

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technical capacity is now there to move forward, the hardware and software resources are now at least adequate and often better, students are very supportive and staff, at worst, do not oppose it and at best are very keen. Most importantly high-level management is eager to develop this side of university teaching. So the climate is favourable.

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