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Classroom−Based Teaching versus Virtual Teaching (UB−UOC): The Case of the Subject Cultura Iberica (Iberian Culture)

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Introduction

The aim of this study is to assess the responses of classroom−based students at the Universidad de Barcelona (hereafter UB) and virtual students at the Universitat Oberta de Catalunya (hereafter UOC) to the teaching of the subject Cultura Ibérica (Iberian Culture) with the support of a multimedia hypertext in CD−ROM format. Cultura Ibérica is an optional subject, bearing six academic credits, in the second part of the history degree at the UB and in the second part of the humanities degree at the UOC, and was taught over the 1999−2000 and 2000−2001 academic years. [The Study Plan of the UB is structured in two parts, or cycles. The first usually contains introductory subjects, whilst the second is formed by more specialised subjects. (Translator's note)] The students' opinions were expressed via an anonymous survey handed out by the teacher at the end of the course, before the exams were held and marked, so as to avoid any influence of the results of the final exam. The comparative analysis shows clearly the different levels of impact of ICTs in the university community, and highlights the dichotomy between connoisseurs/defenders of the use of new teaching and studying methodologies and opponents of these approaches, who are largely unfamiliar with them.

The results of this study should be regarded as referential, not definite, for the sample of students and subjects taught via hypertext was too small to draw definite conclusions.

Multimedia Projects in Prehistory and Archaeology

Very few multimedia products have been developed in Spain for research and teaching in Prehistory and Protohistory. Most have been devised with the aim of advertising databases which already existed or which were produced for conversion into a hypertext in CD−ROM format. Amongst the most interesting are: the Proyecto Au, about a pre−Roman goldsmith, designed by the Department of Prehistory of the CEH of CSIC (Madrid) under the direction of A. Perca (García Vuelta, Martínez, Perca, 1999); the project El caballo en la Cultura Ibérica (The Horse in Iberian Culture), directed by F. Quesada of the department of Prehistory and Archaeology at the UAM, with a webpage presenting the initial results of the project

(www.ffil.uam.es/equus/); the projects run by J. Blánquez at the same Department, such as Laboratorio virtual sobre la Cultura Ibérica (Virtual Lab on Iberian Culture) (www.ffil.uam.es/labvirtual/); the catalogues of three exhibitions entitled Cultura Ibérica a través de la fotografía de principios de siglo. Un homenaje a la memoria (Iberian Culture through the photography of the beginning of the century: a homage to memory) (www.ffil.uam.es/catalogo/Default_1.htm), devoted to the south and south−east areas, the collections in Madrid museums, and the Mediterranean coast. The Revista de Estudios Ibéricos, though printed on paper, allows the reader to consult via the net the contents of the three issues published so far (www.ffil.uam.es/reib). Finally, the Department of Ancient History and Archaeology of the History Institute of the CSIC (the Spanish Higher Research Institute) has developed an eminently graphic CD−ROM database in Los iberos y sus imagenes. La imagen ibérica en CD−ROM (The Ibers and their Images: The Iberian Image in CD−ROM), published by Micronet S.A. These projects vary widely in terms of their conception and facilities and are aimed at the research and advertisement fields, but no multimedia material has yet been designed specifically for university teaching.

The hypertext: Cultura Ibérica

Our experience of CD−ROM production began with La Moleta del Remei. La Cultura Ibérica en el Montsià (La Moleta del Remei: Iberian Culture in the Montsia), a tool designed as complementary teaching material for the museum project of the Iberian village of La Moleta del Remei, in the region of Alcanar, Montsia, in the province of Tarragona, Spain. This CD−ROM was published in 1999, and it coincided with the site's inauguration. Our experience with this project gave us the idea of designing a large−scale product for the classroom−based (and later virtual) teaching of the subject Cultura Iberica at the UB. This subject is an optional second−cycle subject in the history degree, and bears 6 academic credits.

A tool of this kind would have to contain all the information that the student needed in order to study the contents of the subject. The CD−ROM would thus take on the role of textbook. At the same time, it had to contain graphic and textual information that would allow the student to write the course essays whilst accessing additional information (at a primary level) without having to resort to further texts. The CD−ROM also had to allow the instructor to teach the subject in a classroom−based manner. It would thus promote a teaching technique that would be agile and flexible, clearly differentiated, in terms of both form and content, from the more traditional system of oral one−way professor−student explanations.

The hypertext contains a compilation of the current knowledge and theories of the different social, economic and ideological processes at work in Iberian Culture between the sixth and first centuries BC. The CD−ROM contains 2716 electronic pages; 1342 graphics; 400 associated texts for additional information; 66 classical texts, divided into ten categories; an encyclopedical resource (hot words) with 450 entries; a glossary of 400 terms; a data base with cards of 195 archeological sites; a chronograph with 2000 entries; a search engine allowing access to the webpages of 40 archeological sites, and 56 concepts or thematic blocks; 42 links to the Internet which allow access to 42 related web pages divided into five categories; a general bibliography with 1,500 entries; 23 video clips with some 28' of recorded information; an intelligent agent that allows six thematic paths with six specific functions; and a self−evaluation system organised through a data base containing 800 questions with multiple choice answers.

The CD−ROM has two types of path: vertical, in which data are obtained through the successive opening of pages, organised through a branching system that links the contents of the sub−divisions; and horizontal, in which the connections generated through thematic links and hot words interrelate the concepts of the different sections. Specific entries for each section complement the information, highlighting the main ideas of each thematic block. A number of work and support tools at different points along the path allow students to personalise their work on the subject.

The hypertext pages include full explanations of the current interpretation and assessment of the available literature on the subject. This text contains photographs, maps, planimetries, drawings of archaeological

material, Greek or Latin texts, contemporary texts and a bibliography. Throughout the text, the hot words refer the user to specific pages for additional information which, in turn, contain new hot words that interrelate several sections of the hypertext. The glossary includes brief definitions of the main archaeological or artistic concepts for consultation. Lastly, there is a number of Internet addresses, presented as 'activated links', for further consultation.

The main function of the intelligent agent is to guide users through the data, providing them with a logical order of opening of pages in the same work field. Students choose between six thematic paths the subject: the historiography of Iberian Culture; social structures in Iberian Culture; the ideological structure of the Iberian world; the economic structure of the Iberian world; commercial exchanges; population systems; Iberian architecture; and material culture.

Assessment of the project

As part of a collaborative program between the Universidad de Barcelona (UB) and the Universitat Oberta de Catalunya (UOC), the subject Cultura Ibérica has been taught in parallel ways over the second semester of the 1999−2000 academic year and the first semester of the 2000−2001 academic year: in a classroom−based manner, with the support of the multimedia hypertext, to the students of the UB; and virtually, using the same materials, to the UOC students. The approach, staging and marking system were exactly the same for the two groups. The similarities in design of the two courses allow us to reach a number of conclusions about the impact of the multimedia hypertext and the reaction of the two groups of students.

Using hypertext in the degrees of History (UB) and Humanities (UOC) calls for thorough re−planning, on the part of the teachers, of their concept of the subject itself, and the forms in which it can be presented. Provided that the students already have all the materials (both the basic and the additional materials), teachers do not in fact need to deal in class with topics included in the CD−ROM. They can thus organise their teaching around specialised seminars dealing with themes and aspects which could not be considered within the standard teaching parameters of classroom−based instruction.

From our experience with the multimedia hypertext Cultura Iberica in the academic years of 1999−2000 and 2000−2001, we conclude that the use of the CD−ROM in the teaching offers from the teacher's perspective, a number of improvements over classroom−based teaching:

- The structure of the contents can be re−planned and improved; eliminating marginal or non−priority aspects can be omitted and the basic tenets of information favoured.
- Contents can be continuously updated; from the beginning of the course, students have all the information on the subject, and so the sessions cannot amount to a mere repetition of material already available Instead, sessions must expand on the materials, discussing them in greater depth. Thus generalist teaching transforms into specialised teaching.
- The pace of the explanations is faster, as teachers can refer students to the hypertext to study of different parts of the subject, and to expand on the sessions already taught.
- The chance to analyse the contents more deeply than in classroom−based teaching. In classroom−based teaching, the syllabuses are never completed, due to their length; this is result of a generalist concept of what the Plan of Studies should be. There is also the related difficulty of keeping up a teaching pace to allow the majority of students to follow the sessions, together with the problems inherent to classroom−based teaching, in which the number of theoretical sessions assigned to a subject is higher than the actual number assigned by the faculty.
- An increase in interactivity; all the graphic and textual material can be found in just one resource. This is especially useful in the case of the graphic support material which can be consulted and used at any moment in a debate or seminar session.
- The organisation of seminars, text analysis and debates on recommended areas is simplified. The

level of knowledge that the students can achieve over the course, before the preparation for the final exam (when students normally reach their peak of comprehension, assimilation, and understanding of information) allows for the organisation of lectures given by researchers in different fields, together with other kinds of activities.

- The possibility to encourage student participation via the concept of construction of knowledge, in which students either produce or develop parts of the material on the CD−ROM available in the study room.
- The possibility to include different teaching resources, such as continuous evaluation, in the course of classroom−based teaching. Students frequently request continuous evaluation instead of a final exam, or at least instead of part of it. However, the idea of replacing the final exam with a course paper poses a number of problems: whether to allow students to write joint papers; the question of authorship (considering that there are addresses in the net that offer elaborated papers about different specialties); real time used in the composition process; and the monitoring of the contents and development of the paper. On the other hand, continuous evaluation allows personalised monitoring of students' work over a two−week period, allowing them to structure the time spent on the subject and to devote attention to it throughout the course.

The students' attitudes towards a subject taught via a multimedia hypertext and one taught through a more conventional teaching technique differ radically. Students are transformed from passive subjects (i.e. mere recipients of information in lecture−type sessions) to active agents in the production and development of the teaching of the subject (i.e. construction of knowledge), provided that they are involved in the acquisition and classification of information through a deployment of the resources (texts, pictures, links) that the hypertext and its WWW extensions provide. Individual work substitutes, to a large extent, traditional sessions, and the figure of the tutor acquires decisive importance as a researcher debating the most interesting points of the historical processes of this subject instead of the mechanical transmitter of knowledge.

Problems in the use of the hypertext by the students at the UB

At the UB, the subject is taught at the Aula Metode of the Geography and History faculty, where each student has a computer with free access to the hypertext. Here students can work with the CD−ROM outside the regular class timetable. Due to limitations of space and materials, a maximum of 25 students was stipulated, plus six Socrates students.

An opinion survey administered to students who studied Cultura Ibérica in the 1999−2000 academic year using the multimedia hypertext draws attention to the problems inherent to the teaching of subjects with ICT support in the UB, especially in a degree as eminently classroom−based as History. This is a degree in which teaching innovations are not encouraged; the development and use of new technologies is promoted far more in research than in the teaching arena. The results reflect strong contradictions, but they allow us to assess the extent to which university teaching, and the educational system in general, is detached from the cultural and technological reality of our country.

In spite of the many highly publicised attempts to introduce the basic elements of ICT at different levels of primary, secondary and university education, and the continuous bombardment of hypertextual products in the media (generally for free), 95% of the students enrolled in the subject had never worked (in fact had never opened, studied or surfed) with a multimedia hypertextual product of any category even though 50% owned computers equipped with a CD−ROM reader. This clearly indicates the students' dependence on traditional tools of study through paper−support, and evidenced the importance that they attach to the oral explanation provided by the teacher as the basic source of transmission of knowledge, even if the teacher's explanations are merely an organised presentation of information already contained in the textbook: information easily accessible to the students, a formula in which the role of the teacher as regards assimilation should amount merely to tutoring or consulting.

It is evident that the failure of the multimedia system to take root is not merely found at the level of university teaching, which students reach with deeply−ingrained habits and acquired study systems, but at the level of secondary−school teaching as well, where the figure of the teacher as transmitter of knowledge is still very powerful. Another problem lies in the study plans and the numerous reforms implemented in the Spanish educational system in the past two decades to supplant the approach to teaching based on memorisation, inherited from the system of the mid−twentieth century, and to establish another, more participative approach that nevertheless lacks many basic elements. Students thus come to higher education not only totally ignorant of the use of ICTs, but also with serious gaps in their knowledge of the subject matter of (in our case) history and geography. So in many cases satisfactory teaching becomes extremely difficult, as lecturers have to spend the early stages going over material not covered in secondary education.

Not all the problems, however, should blamed on the system. Ninety−eight percent of the students taking the course did not have (and thus did not use) an e−mail account (even though accounts were provided free on request at the Computer Room of the History and Geography faculty). This obviously hampered the organisation of a tutoring and continuous evaluation system through ICT. Likewise, 92% of the students were totally or partially unfamiliar with Internet. This lack of familiarity with the possibilities of using the WWW in order to obtain documents is surprising in a group of students nearing the end of a university degree. The most recurrent reason for their failure to use ICTs was ignorance of the possibilities of the Net and their low evaluation of ICTs as a complement to (much less as a substitute of) classroom−based teaching. In our view, the preference for classroom−based teaching amongst UB students is due not so much to their faith in this particular form of presentation as to their lack of exposure to any other teaching method. To this we should add the crucial role that the teacher has with respect to assessment and qualification of the subject.

These two deficiencies call for a thorough reassessment of the characteristics of History students as a group. We should also assess the integration of new technologies in the UB, both as regards the academic institution itself and its relation to other classroom−based universities where these resources are either widely used or under serious consideration. It may even be that the fault lies with the failure of academic authorities at different levels to consider the need to promote practicum in the Arts.

Sociologically, the UB students express a mixture of interest and fear with respect to multimedia education. Although all those interviewed supported the use of these teaching and study materials, 75% also expressed fear as regards their adaptation to a new, unfamiliar form of teaching in spite of the technological impact of multimedia today. They express their preference for classroom−based teaching as the standard technique to acquire knowledge, even though they agree that teachers often provide information that can be easily accessed in most of the material available for the course. This contradiction is even more blatant when students complain about the level of teaching in a number of subjects taught traditionally. Preserving the figure of the teacher as talking head does not involve, in any case, a higher participation in the development of the course but, rather, the psychological dependence on the part of students on the 'teacher's word' as the sole referent for the assimilation of contents. At the same time, students also acknowledge their overdependence on class notes as the fundamental part (sometimes the only part) of the material to be studied, reflecting the philosophy that subjects are generally assimilated in order merely to be passed. Changing the system of acquisition of the study material would in many cases represent a serious structural problem for students.

Nevertheless, experimentation with hypertexts is gaining in popularity amongst students. Places on the courses Cultura Ibérica and El present en clau històrica (The present from a historical perspective), the only ones that use ICTs, are also the first to fill up in the faculty of Geography and History. This is due to word of mouth: 90% of the individuals polled affirm that hypertexts are useful in improving teaching. The same proportion (90%) were in favour of introducing these materials in more subjects, and as many as 60% supported the creation of groups of subjects in which the teaching was actually based on these didactic resources.

An astonishingly high proportion of those surveyed (90%) considered that multimedia hypertext improves

access to information on course contents; 86% reported that it improves these contents. However, a majority (although lower) of those surveyed (56%) stated that access to a multimedia hypertext does not necessary entail more study hours. So the multimedia hypertext is useful in allowing student access to the object of study, freeing them from the need to carry out bibliographical research. Simplifying the form of study does not mean that students have to devote more time of their own to the study; on the contrary, it allows them more time for other activities.
In the case of this experiment, among the 30 students studying at the UB in the 1999−2000 academic year were six students on the Socrates exchange program, from a number of foreign universities (Pau, Amsterdam, Liège, Berlin, and Karoly Gaspar in Budapest). They reported that their universities do not use any multimedia resources either as support or as the basis for the teaching, so they were not at an advantage, compared with the UB students, as regards studying via CD−ROM. This consideration is important in the case of students who have obvious difficulties in expressing themselves in Spanish. That is to say, the reading of texts could be, a priori, a negative element for their study, and traditional teaching might have been more effective. However, these students were used to computers (although not in the teaching arena), and they were familiar with e−mail resources, multimedia possibilities, and access to Internet. All of them devoted between four and five hours a day outside the teaching timetable to the work with hypertext and to self−evaluation using the CD−ROM. Significantly, all these students passed the subject, in some cases with high grades. The language barrier clearly posed no problem, even though most of them were studying a subject that was new to them; only two out of the six Socrates students had taken archaeology studies in their universities of origin. Interactivity and easy access to materials are, therefore, two of the main advantages of multimedia hypertexts.

It is difficult to offer potential solutions to the UB students' lack of familiarisation with ICTs. It seems sensible to recommend the introduction of courses with basic computer systems, in the first years of the degree, as is the case of UOC.

As part of the experiment, all students were provided with an e−mail address to enable them to consult the teacher outside the regular class timetable, so as to encourage student participation in the subject. However, in spite of the repeated instructions concerning its use, both from teachers and from staff at the Aula Mètode, only one e−mail message was received during the term. This reluctance to use the resources is probably due to the students' lack of familiarisation with ICTs. They do not seem to realize that any doubts arising from the continuous studying of the subject can be swiftly solved through this method, instead of waiting for face−to−face class meetings. However, even in classroom−based sessions it is difficult to encourage student participation, and this attitude seems to have increased in recent years. Amongst the possible causes for the reluctance to participate in class, there is primarily the socially related fear of feeling embarrassed in front of the rest of the members of the collectivity. A high number of students believe that expressing doubt about an aspect (which has nothing to do with ignorance per se) undermines their situation in the core of the group to which they belong and, what is worse, in front of the teacher as well. And yet they make no use whatsoever of the anonymous method of e−mail as a way to express their doubts.

The absence of questions in the classroom, reflecting the lack of a critical perspective as regards subject contents, is confirmed by the scarce use that UB students make of their instructor's office hours. Students appear unaware of the potential usefulness of visiting times. A good idea would be to devote this time to more classroom−based instruction.

It is also disheartening to see that in the years of peak popularity of ICTs, only 50% of students consider them as useful to expanding the contents of the subject via Internet access. They still prefer the teacher to organise the material. In addition, they consider expanding on the material as a mere distraction from the study of the basic texts presented by the teacher. It is not surprising, then, that all those interviewed wanted to receive their ownCD−ROM at the beginning of the course. This demand is the result of the traditional need to have the textbook, a compendium of the subject (and also a symbolic element of salvation for students), from the very beginning of the course. An interesting contradiction arises from the fact that less than half the students consider it useful to transform the hypertext into an on−line system that would allow

access to the same materials through the net. If we compare this with the high demand for on−line history subjects offered by UB−MEDIA [UB−MEDIA is an organisation within the UB which offers virtual courses. (Translator's note)], we can conclude that there is a technological and cultural breach between two kinds of students: those who have accepted the challenge of ICTs and know the basic tools to work with multimedia hypertext and educational web pages, and those who have not yet made the jump to recycle their systems of access to information. The latter are firm defenders of traditional teaching, as they do not want to confront the dual problem of learning the subject and learning how to access information about it.

The ignorance of the ICT society among the UB students and their fear of lagging behind within a system of teaching that primarily applies ICT are the reasons for the astonishing reluctance on the part of students to enroll on a course that uses hypertext resources as basic didactic tools. Although all students recognized the advantages of using ICT in teaching through hypertext and CD−ROM, only 50% would accept teaching based primarily on this kind of material. The problem has nothing to do with teachers, contents, or timetable but, rather, with reasons deriving from their own unfamiliarity with the use and the potential of ICTs: the non−existence of a habit of university study (student work tends to amount mainly to attending lectures and taking notes), the ignorance of the teacher's role in ICT teaching, the need to devote more hours to a subject with a CD−ROM than to one without, reticence on the part of teachers to adapt their teaching to ICTs, which obviously influences the students' perceptions; and, evidently, a general disenchantment with the structure and contents of university teaching in general and history teaching in particular.

Nevertheless, as we said above, the reaction of the Socrates exchange students was entirely different. All those interviewed were totally in favour of courses with multimedia resources, and they all made wider use of their possibilities than UB students. In the case of UB students, we are struck by their fear of ICTs, and also by their refusal to reflect on the advantages and the meaning of teaching with hypertext support. Students have not understood that producing these resources involves the creation of new teaching teams, reassessment of subject contents, renovation and restructuring of teaching material and a general improvement in the quality of teaching − which is one of the main (if not the main) demands of student associations. Improving teaching quality definitely involves working with ICTs, together with student involvement in teaching through personal learning of the basic stages of the subject. A constant reduction in real contact hours in the new study plans has caused − and will continue to cause − a significant decrease in subject contents. If traditional teaching methodologies continue, the decrease in the number of contact hours and the decrease in the training of students in secondary education will no doubt be reflected in a more limited education for university students. This situation can only be remedied either via shock measures (a decrease in the number of students per group, an increase in the teaching staff, an increase in contact hours, a reorganisation of subject paths that the students can take throughout the degree) or by rejecting the inertia of the teaching method involving word/memorising/answer, which inevitably leads to deficient learning.

As we said above, the contradictions inherent in the answers to the survey by UB students are multiple. Amongst the advantages in the use of multimedia hypertext for students we could mention: support for the theoretical and documentary bases of the explanations provided in class; availability of bibliographical search sources; immediate access to a high−level, useful iconographic support; easy access to the different sections; availability of complementary texts; the possibility to access subject contents. Nonetheless, 60% of those surveyed could not answer the question: what advantages do you see in the use of multimedia hypertexts to approach the study of this subject? This shows a disheartening lack of a critical position amongst students.

The clear−cut differences between UB and UOC students are reflected in the answers to the questions on content evaluation. Although UB students welcome the introduction of a self−evaluation tool as a means of anonymously grading their assimilation of the subject, they are thoroughly opposed (80%) to the use of this tool as evaluation, even when the questions are formulated together with three possible answers. They are also opposed to the introduction of a saving option for the tests that they voluntarily complete inside the self−evaluation option, so that they can be checked by the instructor; in this way the instructor can analyse

(without any future repercussion on the final grading) both the student's work, and his/her level of assimilation of the subject. UB students are completely in favour of maintaining the traditional exam system (85%), even though it perpetuates learning techniques based on mnemotechnical devices over a condensed period time.

Eighty percent of UB students also reject the option of continuous evaluation. Their main charge against it is the difficulty involved in writing four or five papers throughout the course, even though this would release them from writing a final exam. The rejection of a system based on progressive work and dimensional assimilation of contents, which should initially be regarded as a support to the the teacher, demands further thought. Their resistance to change does not reflect a desire to maintain the deeply rooted exam culture. It rather has to do with the general conception that UB students have of dealing with their study of subjects. They believe, for instance, that they are not prepared to carry out work on a subject until the teacher has finished his/her explanation of the entire course content, after which they start studying. Although this attitude presupposes the maintenance of the method word/memorisation/answer, continuous evaluation should progressively become a key part in the grading process of any subject, together with the increase in practicum. Memorising without learning is not the final objective of teaching.

Problems in the use of the hypertext by the students of the Universitat Oberta de Catalunya

The UOC students have the advantage of being members of a virtual university, a fact that obliges them to adapt to the use of ICTs for all teaching activities. Obviously, none of them reject the use of a hypertext as a basis for teaching. UOC students reacted to the subject in a completely different way from UB students, both as far as the work with multimedia hypertext and course participation were concerned.

The students enrolled over the two semesters took the option of continuous evaluation. This consisted of producing four papers over the course (one every three months), which they wrote whilst studying the six modules of the subject every week, participating in on−line debates about topics of the subject, and specific complementary activities such as readings, visits to sites, etc. None of the students gave up continuous evaluation, and they met all the deadlines. Unlike their counterparts at the UB, UOC students made full use of their instructors' office hours, communicating continuously throughout the process of writing the papers (presentation of outlines, debate of the contents to be dealt with, bibliographical requests...). Their productivity was impressive, taking advantage of the possibilities of the net in order to expand contents, and achieving a much higher standard in the work they handed in than the UB students − in a much shorter time. The difference in quality between the two kinds of work (classroom−based and virtual) may be attributed to differences in the pace of work at the two institutions: essays at the UB are normally written over the last weeks, even when they have been planned at the very beginning of the course. One last difference is the fact that the papers written by UOC students reflect a desire to improve their understanding of the subject comprehension, whereas those written by UB students are − with one or two notable exceptions − clearly considered as a mere formality on the way to the final exam. The interest and dynamism of UOC students in the writing of their papers is particularly noteworthy considering far as continuous evaluation did replaced only a very small part of the final exam.

The UOC students made ample use of the e−mail to ask questions about the subject contents, at a rate of almost twenty questions per person (apart from the posts on the message boards). The UB students did not make any use of this resource. The questions were normally answered individually, but when the topic was of general interest, the instructor made use of the option forum or tauler del professor (instructor's message board) in the virtual campus, by which answers reach all the students. These questions are an excellent indicator both of the problems that the hypertext can pose, and of the students' interest in certain topics; so they work for the benefit of teaching.

An analysis of the progress of UOC students shows that student benefit from the subject is higher than that

of UB students. The causes for this disparity are difficult to assess but some factors to be taken into account are: UOC students tend to be older than UB students (ever since the inauguration of the virtual university there has been a decrease in the number of older students, and of students who work, at the UB); a higher predisposition to study among by UOC students, due to the special characteristics of virtual teaching; the higher benefits derived by UOC students from new technologies; and the differences in intellectual ability in students at the two universities.

Conclusions

In spite of the problems encountered, the experience of teaching Cultura Ibérica over the 1999−2000 and 2000−2001 academic years at the UB has been extremely positive. The level of learning of the students who used the hypertext was higher than that in previous years, when the subject was taught in a traditional way. Students' grades have increased by an average of 1.85 points. This means that the experiment shows a quantitative, objective result: students learn more efficiently through the use of a hypertext, in spite of the reticence that they express about it.

In our opinion, the introduction of multimedia hypertext in teaching innovation groups such as TEAM−UB TEAM [(Tecnologies per a l'Educació i l'Aprenentatge Multimèdia) translates as Technologies for the Multimedia Education and Learning. It involves a series of projects that aim to promote the introduction of ICTs within the University environment. (Translator's note)] is a key factor in improving teaching quality at the UB. Future teaching (or present teaching for that matter) must combine both virtual and classroom−based resources. So teachers and students alike must adapt their work and study techniques. Likewise, institutions should provide work teams with the necessary resources and infrastructure for materials of this kind to be designed and implemented. It is not possible to talk about progress in teaching if its ways of delivery are never changed. If we can overcome teachers' fears and reticence, an improvement will come about through the rapid adaptation of teaching to new technologies (especially in such institutions as the UB, traditionally considered a reference point in teaching). The primary aim of the university is teaching, and the transmission of knowledge is a shifting science, not a static one. The statements in the Informe Bricall [The *Informe Bricall* is the popular name given to a report published in 1999.. The report assessed both current and future problems facing the Spanish university system, together with potential solutions. It was written by Josep Mª Bricall, former rector of the UB. (Translator's note)] and the plans of the Conselleria d'Universitats of the Generalitat de Catalunya [The *Conselleria d'Universitats* is the Ministry of Higher Education in the Catalan government (*Generalitat de Catalunya*). Its main task is to assess the situation of university education inCatalonia. (Translator's note)] abound in the need to strengthen ICTs in higher education.

Bibliography

García Vuelta, O.; Martínez Calvo, Mª.V.; Perea, A. (1999): El repertorio AU de macro y micrografías metalográficas. Revísta de Arqueología, 216, pp. 24−34.

García Vuelta, O.; Perea, A. (1998): An example of using a relational database for the study of technological domains in the Prehistory of the Iberian Peninsula. XXVI Computer Applications in Archaeology. Barcelona, septiembre, 1998.

Gracia, F. (2000): Análisis comparativo de la docencia virtual y presencial (UOC−UB) de la asignatura Cultura Ibérica. II Jornades de Multimedia Educatiu. Universitat de Barcelona. Edición en CD−ROM.

Gracia, F.; Munilla, G. (1998): Tutorial inteligente "Cultura Ibérica. La Historia en una nueva frontera. XIII International Conference of the Association for History & Computing. Toledo 1998.. F. Aranda, F. Fernández y P. Sanz (Eds.). History in a new frontier CD−ROM. Ed. Universidad de Castilla−La Mancha.

Gracia, F.; Munilla, G. (1998): An interactive tutorial software for learning Iberian Culture, and a multimedia presentation of the iberian village of La Moleta del Remei. XXVI Computer Applications in Archaeology. Barcelona, septiembre, 1998.

Gracia, F.; Munilla, G. (1999): La Moleta del Remei. La Cultura Ibérica en el Montsià. CD−ROM. Col Team UB−.2. Universitat de Barcelona.

Gracia, F.; Munilla, G. (1999): Cultura Ibérica. Valoración de la docencia en arqueología con apoyo de hipertexto. I Jornades de Multimèdia Educatiu. Universitat de Barcelona. Edición en CD−ROM.

Gracia, F.; Munilla, G. (2000): Cultura Ibérica. Docencia en arqueología con apoyo de hipertexto. Digithum,2. UOC.

Gracia, F.; Munilla, G.; García, D. (2000): Patrimonio y docencia. Hipertexto multimedia Cultura Ibérica. Revista de Arquelogía, 232, pp. 6−13.

Izquierdo Peraile, I. (1999): La difusión de la arqueología a través de la tecnología multimedia: el CD−ROM Los Iberos y sus imágenes. AA.VV: XXV Congreso Nacional de Arqueología. Valencia, 1999, pp. 512−518.

Izquierdo, Mª.I.; Martínez Quirce, F.; Mayoral, V.; Morillo, M. (1998): La sociedad ibérica y sus imágenes. Divulgación e investigación en informática de la cultura ibérica. La Historia en una nueva frontera. XIII International Conference of the Association for History & Computing. Toledo 1998.. F.Aranda, F.Fernández y P.Sanz (Eds.). History in a new frontier CD−ROM. Ed. Universidad de Castilla−La Mancha.

Martínez Quirce, F.; Mayoral, V. (1998): Los iberos y sus imágenes. La difusión en CD−ROM de una propuesta científica. AA.VV. Los Iberos, Príncipes de Occidente. ED. Fundació Caixa de Pensions. Barcelona, pp. 225−229.

Munilla, G.; Olesti, O. (1998): Els ibers. Programa de los Cursos de Verano de la Universitat Oberta de Catalunya (UOC). Ed. UOC. Barcelona.