X CONGRESO INTERNACIONAL SOBRE TECNOLOGÍA Y EDUCACIÓN A DISTANCIA

TOMO II

El Estudiante de la Educación a Distancia en la Perspectiva de un Nuevo Milenio

X CONGRESO INTERNACIONAL

TECNOLOGÍA Y EDUCACIÓN A DISTANCIA

"El Estudiante de la Educación a Distancia
en la Perspectiva de un Nuevo Milenio"

MEMORIA

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INTERNET, MULTIMEDIA AND VIRTUAL LABORATORIES IN A "THIRD WORLD" ENVIRONMENT: HOW WE SOLVED THE 21 BASIC PROBLEMS IN THE COSTA RICAN DISTANCE EDUCATION UNIVERSITY

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Víctor Hugo Méndez-Estrada[1]

During four years we have produced courses and educational material for use on-line (via Internet), based on multimedia applications, and designed virtual laboratories that work in cheap computers, with a very low budget and despite significant hardware limitations. We summarise our results in the hope that what we have learned will be useful for low-budget institutions in certain areas of the USA and Europe, as well as for most universities in Latin America, Africa and the Pacific.

Secondary school massacres and the increasing market for distance education

Electronic education faces 21 basic problems everywhere in the world (Monge-Nájera et al. 1999). Of course, the number can vary according to how they are classified, but after checking all the papers from the VIII and XIX International Congresses on Technology and Distance Education we are satisfied with this classification. Electronic education has become a central issue in distance universities because Internet has grown significantly and because there are new needs that range from the ageing of the world population (the experience and responsibility of senior citizens make them good distance education students, Villegas 1998) to school massacres that lead parents to search for education-at-home options (Monge-Nájera et al. 1999). In poor countries, universities that in the past only faced local competition, must now compete with institutions from Europe and the USA that offer on-line courses with practically no need to invest in the countries where they expand thanks to Internet.

In Latin America the market is also open to small private "garage" universities that reduce costs to the extreme; they mainly teach business administration and do not spend in scientific research.

The Costa Rican Distance Education University, UNED, has 20 years of experience but has been clearly unprepared for technological change. In this paper, we explain how we successfully adapted to electronic education despite the inadequate conditions.

A characteristic of UNED has been its erratic course about research. Originally, there was no research. After the first decade, two research units were created, one to compile institutional statistics (a function that would hardly be accepted as scientific research by international standards) and one to evaluate teaching techniques. Later, a general research unit was added to the list, but it did not operate for years and when it finally did, with relative success (it was composed of three researchers that reached the highest per capita production of papers included

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in *Current Contents* for a Costa Rican research center, Monge-Nájera 1998), it was closed because some authorities believed that a distance education university should only study distance education techniques.

Most personnel was distributed among other offices and only a single, small Academic Research Center remained, with a staff of seven researchers (three with temporary part time positions only) and a budget, excluding salaries, of $5500 per year. Even by African standards, one can hardly imagine worse conditions to do research. During all these changes, UNED was unable to retain a research director: in five years, four directors left or resigned rapidly because of bureaucratic obstacles and other difficulties. In this period, there was a continuous output of at least two books, four scientific papers and three symposium papers per year. In the last two years, the center also produced one electronic course, a support web page for students and four virtual laboratories. Here we explain how we were able to maintain this output despite such limitations.

A bitter-sweet experience with the new technology

In 1993 UNED experimented with electronic mail and multimedia for the first time. Six years later, electronic mail is still a nightmare for users and the original ToolBook multimedia are not used in any course (Gutiérrez et al. 1998). The videoconference and Silicon Graphics audio-visual material practically are not used after their beginnings in 1994, while network teaching tools *Quorum* and *Learning Space* (Cisneros 1998, Cruz et al. 1997, 1998, Rivas et al. 1997, Gómez and Rivas 1998), tested in 1997, are not used, and the seven courses designed with them are mostly unfinished (Gutiérrez et al. 1998). Earlier attempts with video and audio were also discontinued. Students did not receive marks for using them, most did not use them, and the value of those methods was never evaluated (Gutiérrez et al. 1998), albeit experience elsewhere indicates that even interactive television (often via compressed video) is expensive, troublesome and unsatisfactory in many cases, reaching a 90 % failure rate (Kochman 1997). The value of new technologies normally is overestimated (D'Alton 1997, Moreno 1997), as is the importance of information available in Internet (a 1998 study reported in www.zdnet.com indicated that only 15 % of web pages are indexed by even the most comprehensive search motors such as Hotbot, Altavista, Yahoo or Excite, and see Torok 1997). Printed book distance education is cheaper than standard education (Bolaños 1997), but electronic education normally requires more teacher-hours than traditional distance education, contrary to the popular belief (Torok 1997).

The typical Latin American distance education students are female, around 30 years in age, seldom attend tutorial meetings, have jobs and in 50 % of cases, are married (Bolaños 1997, Cortiñas and Novello de Mettler 1997,Gutiérrez 1997, Cruz et al. 1998). Most cannot read English, require a mean 7.5 years to graduate and a decreasing but yet significant proportion are not familiar with computers (Cruz et al. 1997). Nevertheless, innovative schemes, such as a student fund to buy new computers (Sandoval 1998) and the finding that previous experience is not necessary for a successful adaptation to computers, at least for Costa Rican distance education students (Seas 1998), suggest that computers can play an important role for UNED in the future, even in new fields such as teaching impaired students, who traditionally have a very high failure rate (nearly 90 %, Herrera 1997) and because the reduction of course length from six to four months makes some experiments, particularly in agriculture, impossible (Rodríguez and Vargas 1998).

"Third world" printed textbooks are traditionally inferior to those produced in Europe and the USA, specially in editorial quality and graphic design (Núñez 1997, Víquez 1998). We wanted to avoid this "tradition" by preparing electronic support material, courses and virtual laboratories that did not look "second class". Our first attempt was the electronic version of a book resulting from an international symposium that we organised in 1997, *The Biological Origin of Music* (published on-line in April, 1998 in www.uned.ac.cr/ciac). The document is illustrated with classic paintings and ethnic instrument photographs that reflect the symposium papers; the visitor can listen to music played in antique instruments and even the sounds of mammoth bones. This was done at practically no cost because the Editor donated all the work involved with translating the digital files submitted by participants to HTML and other Internet compatible formats.

Success with the symposium led us to experiment with the first on-line course. We selected tropical biodiversity because a printed book on the subject was under early production, and we decided to make it available free of charge. Similar courses were already available in Japan, as a result of government barriers to official electronic education (Jussila 1998).

An easy way to produce a hybrid (printed-electronic) course

By producing both the printed and the electronic version simultaneously (Monge-Nájera et al. 1999)., we reduced costs to $500 for the electronic version, because illustrations and text production were covered for the printed book, whose files in MS Word 7.0 were translated to HTML by copying and pasting into MS Front Page 97, a software that was later used to define layout and links. Image definition was reduced to 72 DPI (the printer uses 240 DPI) with Adobe Photoshop. The cost per course was 25 times lower than in Canada (Robertson and Mattock 1998).

Automatic drill evaluation

At the end of all sections, the student is presented with multiple choice drills and through a careful use of links, sent to the next lesson or, if the choice was wrong, to a page that advises further study of the lesson. More sophisticated automatic evaluation exists in Japan (Jussila 1998).

Navigation and communication among students and teachers

Electronic mail is not properly used by many students and often overloads the teacher (Barilli 1998), while electronic chats reduce participation and require time synchronisation (Pensa and Sabulsky 1998) so we chose a Bulletin Board System, which prevents those complications, accumulates questions, answers and opinion in searchable form (Olmstead 1997, Bailey and Luetkehans 1998), and increases participation of shy students and the quality of language composition (Nilsson et al. 1998).

Internet links: not as good as expected

Like Nilsson et al. (1998) in Sweden, while selecting web links for our electronic course we found that claims about the futility of preparing original material because "you can find anything

in the Internet" is, at least for the moment, a myth. We concluded that for the foreseable future, many universities will have to produce their own on-line educational materials. If these are protected by use fees and stringent copyright terms, it is unlikely that they will be useful for the small institutions that most need them.

For a low budget, digital robots and academic freeware

We are very satisfied with the quality of the resulting material, which meets international requirements (see Dooleg and Edmundson 1997, Gueulette et al. 1997, Arguea and Cañas 1998). All our courses are in HTML, which makes them useful in Macintosh, Windows, Linux and other operating systems. They can be copied and distributed in diskette, CD-ROM, tape, via Internet, etc. This eliminated the problem of slow or expensive Internet connections except when the Bulletin Board System was required. Printed ready QuarkXpress files can be automatically converted for the World Wide Web with software such as BeyondPress, Challenger XT or WebXPress (Cruise 1998) with "digital robot" software whose price ranges from $200 to $2000. In poor areas such as southern USA, Africa and Latin America, the low costs of hybrid production should be particularly attractive.

Even if a low budget prevents the use of commercial software, money is not a valid excuse: everything you need to produce electronic courses is available for free. For example, *Tropiweb*l (inside www.ots.ac.cr with mirrors in www.ucr.ac.cr, www.ots.duke.edu and in the future probably in www.jaguar.ac.cr and www.tropiweb.com) has tested virus free freeware, as follows (function: freeware name):

Word processing: WordWorth.
Image manipulation: Imagewerks.
Image conversion and storage: XNView.
HTML editor: AOLPress.
Web browsing and using the course: AOLPress.
Multimedia: IrfanView.
Uploading the course, for example, to a free page hosting service: LeechFTP.
Agenda, student mark database, etc.: Skwyrul.

Solving the 21 problems of electronic education

To avoid the "shoot the verb" approach of software experts who develop courses, we inverted the formula: the courses were developed by teachers who learned computing skills, not the other way around. In a few weeks of mostly autodidactic study, we learned enough to avoid most calls to the technical support department (which in any case is non-existent in UNED). We saved the small budget to hire technicians for specific goals (such as organising the Bulletin Board System). This prevented all the problems associated with in-house technicians.

Copyright problems were non-existent because we used the original material produced by the same team for the printed book. However, we have not solved the question of author royalties for the electronic version, because we are still trying to understand the reply of our legal department.

We created interest in teachers, student and other parties by:

1. *Informing the media.* After a failed attempt to do it through the institutional department, we sent information directly to the media and got coverage in two television programs and one newspaper.

2. *Including public shows of the courses in the periodic meetings of schools.* Practically all scepticism disappeared as teachers saw the courses operating in their own hardware.

We were not plagued by informatic virus, hardware failure and software incompatibility or "bugs" because we rejected the use of "the most recent update" that salespeople would like us to have. We limited ourselves to older, tested software and hardware we were familiar and never regreted our decision. Student passivity was excluded by using HTML, which requires frequent input to navigate the course. We left space for real practical activities (we agree that virtual experiences cannot fully substitute "the real thing"), and reduced the problem of Internet overload by making courses as self-contained as possible and by including selected links only.

There were, however, other factors that explain our success in an environment of infrastructure and budget limitations: (1) our department heads always supported our work and (2) we believed deeply in what we were doing. If these two ingredients are absent, even an exorbitant budget may fail to produce satisfactory results.

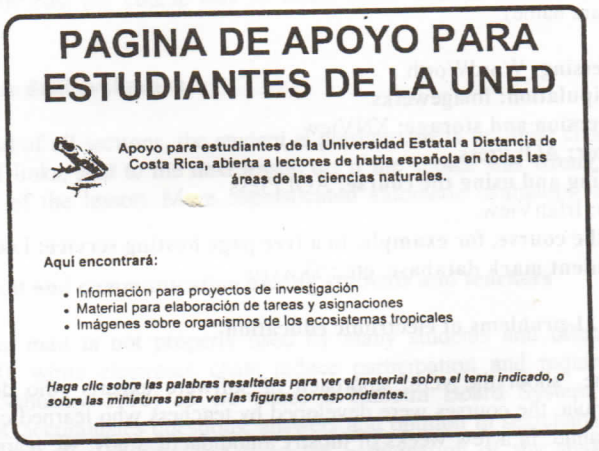

Figure 1. The first electronic course support document produced by a Costa Rican university *The World of Tropical Nature* (UNED, February 1998). Authors: Julián Monge-Nájera, Marta Rivas and Víctor Méndez.

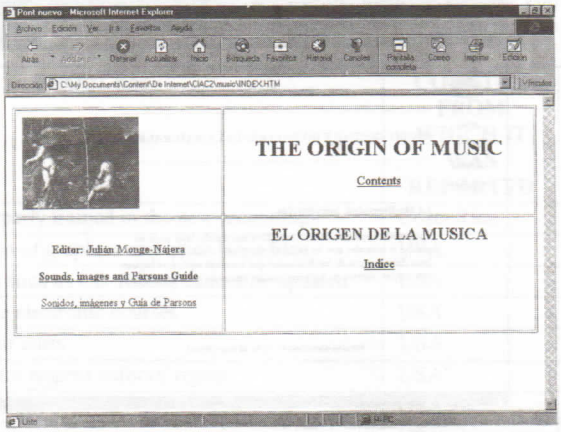

Figure 2. The first multimedia symposium *memoir* of a Costa Rican university: *Biological Origin of Music* (UNED, April 1998). Author: Julián Monge-Nájera.

Practica y Evaluación del software

El Módulo 0 tiene doble propósito, por un lado practicar con el uso del software, por otro, evaluarlo como herramienta de estudio.

Tareas:

1.- Evalúe el software, considerando los siguientes aspectos:

a) Amigabilidad

b) Herramientas (CourseRoom y Schedule)

c) Relate su experiencia personal con el software como estudiante.

d) Haga una comparación entre el modelo tradicional de educación a distancia y el software como y herramienta educativa.

2.- Exponga los principales problemas identificados hasta el día de hoy, considerando los siguientes aspectos:

a) Problemas del Software.

Figura 3. The first intranet course by a Costa Rican university: *Contemporary Contributions in Qualitative Research with Emphasis in Focus Groups* (UNED, May 1998). Author: Benicio Gutiérrez Doña.

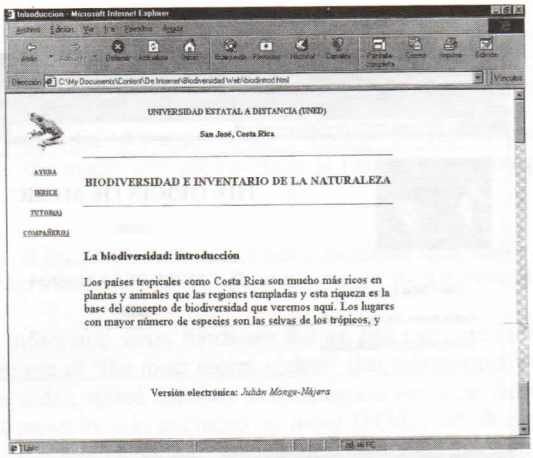

Figura 4. The first "free for all" on-line course by a Costa Rican university: *Tropical Biodiversity* (UNED, May 1998). Authors: Julián Monge-Nájera and Víctor Méndez with the collaboration of Patricia Gómez Figueroa and Marta Rivas Rossi.

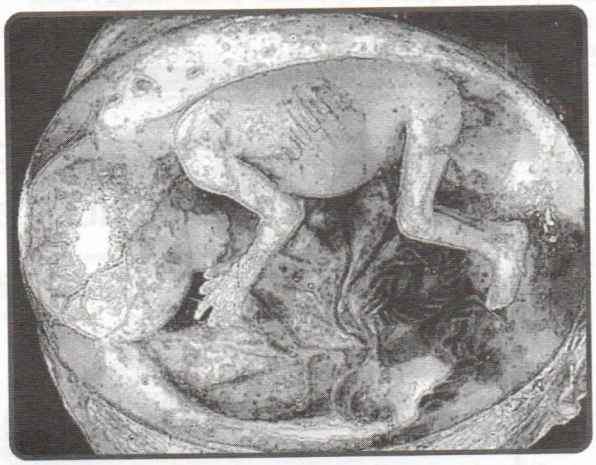

Figura 5. The first virtual laboratories produced by a Costa Rican university. The four laboratories include a virtual pet or tamaguchi to teach proper nutrition, animated experiments with plant and animal reproduction, a student-controlled travel inside the human digestive system and a virtual body that can be dissected (tissues are dragged to a microscope icon to see microscopy preparations. Authors: Julián Monge-Nájera, Marta Rivas and Víctor Méndez.

Table 1: *Basic 21 problems* of electronic education (from Monge-Nájera et al. 1999)

PROBLEM	COUNTRY FROM WHICH IT WAS REPORTED	REFERENCE
1. Teachers not properly trained in the new technology	Costa Rica	Rodino 1998
2. Slow transmission of graphics and other large files	USA	West 1998
3. Read only media such as CD-ROMs cannot be updated	USA	West 1998
4. Few students take electronic courses	USA	Kochman 1997
5. High management costs	USA	Kochman 1997
6. Institution does not respect authors' rights	USA	Kochman 1997
7. Expensive technology	USA	Kochman 1997
8. Software failures	USA	Kochman 1997
9. Failures in computer hardware, and in audio and video equipment, that often persist for years	USA, Costa Rica	Kochman 1997, Araya 1998, Gueulette & West 1998
10. Lack of interest or open rejection by teachers and administrators	Costa Rica, México	Rodríguez 1997, Cedillo 1998
11. Some electronic means such as traditional television favour student passivity	USA	Chadwick 1998
12. Having a computer does not improve student achievements	USA	Chadwick 1998
13. "Virtual" and "distance" education are inferior to real presence	USA	Chadwick 1998
14. Courses and tools are developed by computer experts who ignore teaching principles	USA	Chadwick 1998
15. Abundance of Internet material saturates and misguides the student	Germany	Laaser 1998
16. Exchange facility (e.g. e-mail) lead to abuse: teacher is more overworked than in traditional courses	Germany	Laaser 1998
17. Non existent or expensive Internet access	Costa Rica	Araya 1998
18. Vulnerability to informatic virus	Costa Rica	Araya 1998
19. Frequent abuse of copyrighted material	Costa Rica	Araya 1998
20. Incompatibility problems with hardware and software	USA	Gueulette & West 1998
21. Technical support often ranges from non existent to very bad or at least unsatisfactory	USA	Gueulette & West 1998

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