How to overcome budget, technology and personnel problems when teaching via Internet, multimedia and virtual laboratories

Julián Monge-Nájera Marta Rivas Rossi, Víctor Hugo Méndez-Estrada

Centro de Investigación Académica (CIAC), UNED. Apdo. 474-2050 San Pedro, M.O. San José, Costa Rica. Fax (506) 2249216; martarivas@hotmail.com, victorhugo@hotmail.com, julianmonge@homepage.com

RESUMEN

Por cuatro años hemos producido cursos y material educativo para uso en Internet, basado en multimedios, y diseñado laboratorios virtuales que funcionan en computadoras baratas, con un presupuesto muy bajo y grandes limitaciones de equipo. Acá resumimos nuestros resultados con la esperanza de que resulten útiles en instituciones de poco presupuesto en áreas pobres de Estados Unidos y Europa, así como en la mayoría de las universidades de América Latina, África y el Pacífico.

ABSTRACT

Electronic education has 21 basic problems in any country. These problems are particularly dangerous in poor countries and include difficulties with people (students, teachers, administrators), hardware (computers, networks, etc.), software (from informatic virus to incompatibility) and small budgets. For the production of materials that range from on-line support documentation to virtual laboratories, the Academic Research Center of the Costa Rican Distance Education University has faced difficulties with budget and facilities that could hardly be worse anywhere in the world. For this reason, we believe that the present description of the solutions we found for most of the 21 problems will be useful for our colleagues everywhere.

Much before the publication of Jan Komenský's *Opera didactica omnia* in 1657, educators have wanted to teach better, to reach more students and to do it at a lower cost. In the last 5000 years, proposed solutions to the education problem

have included two Chinese inventions and one European creation: writing, the press and the *world wide web*. The Academic Research Center of the Costa Rican Distance Education University UNED has been experimenting with the *web* and other electronic education technologies for five years, under "Third World" conditions and has found some solutions to the 21 commonest problems of electronic education. These problems involve financing, personnel and technology, and are not limited to poor countries. The solutions we found are acceptable and realistic, we believe we ought to share them with our colleagues from around the world.

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 summarize 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 aging 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 (our first on-line experience was a course support page).

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 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 organized 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 and the USA, where a computer program that grades research papers with the same marks that a human committee in now available for a fee to teachers who do not want to read their students' work (Jussila 1998)

Navigation and communication among students and teachers

Electronic mail (tested in an intranet course, is not properly used by many students and often overloads the teacher (Barilli 1998), while electronic chats reduce participation and require time synchronization (Pensa and Sabulsky 1998) so we chose a Bulletin Board System, which prevents those complications, accumulates questions, answers and opinions 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 foreseeable 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* (inside www.ots.ac.cr) 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 organizing 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 (free on-line courses are of public interest.

2. *Including public shows of the courses in the periodic meetings of schools.* Practically all skepticism 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 regretted our decision. Student passivity was excluded by using HTML, which requires frequent input to navigate the course (we took particular advantage of this characteristic in the virtual laboratories. 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.

Acknowledgments

An earlier version of this paper was presented in the X Congreso Internacional sobre Tecnología y Educación a Distancia in San José, Costa Rica (1999). This version was improved thanks to the comments of some participants.

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 favor 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

BIBLIOGRAPHY

Arguea, N., A. Cañas. Mapas conceptuales como herramienta en estadística aplicada: Una propuesta para un curso a distancia. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo I. Editorial UNED, San José, Costa Rica, p. 20-30, 1998.

Bailey, M., L. Luetkehans. Guidelines for facilitating virtual learning teams in web based instruction. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo I. Editorial UNED, San José, Costa Rica, p. 62-68, 1998.

Bolaños, F. Propuesta de un sistema de soporte para la evaluación académica en la UNED de Costa Rica. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 290-305, 1997.

Cisneros, M. "El aprendizaje colaborativo con el empleo de learning space, caminando hacia una nueva cultura del trabajo en un ambiente virtual. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo I. Editorial UNED, San José, Costa Rica, p. 125-132, 1998.

Cortiñas, M. C., S. Novello de Mettler. Carrera de técnico en control bromatológico a distancia presentación de experiencias: formación de recursos humanos en inspectoría de alimentos. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 69-76, 1997.

Cruise, J. 1998. XPress-to-Web Translators. XTensions Ease Web-Page Creation. http://macworld.zdnet.com/ (consultado en marzo de 1999).

Cruz, A. et al. Resultados de un curso piloto impartido en la UNED de Costa Rica mediante a programa learning space. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo I. Editorial UNED, San José, Costa Rica, p. 150-159, 1998.

Cruz, A., et al. Guía practica para mejorar programas académicos: el caso de administracion dl empresas en la uned dl costa rica. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 97-107, 1997.

D´ Alton, C. Arte *y* desarrollo. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 332-337, 1997.

Dooley, K., C. Edmundson. Instructional design for agricultural content over interactive video. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el

Siglo XXI. Editorial UNED, San José, Costa Rica, p. 108-113, 1997.

Gómez, P., M. Rivas. Uso de una herramienta colaborativa en el curso de "biodiversidad e nventario de la naturaleza". IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo I. Editorial UNED, San José, Costa Rica, p. 273-278, 1998.

Gueulette, D. G., et al. The internet, the classroom and distance education: issues of quality and equity. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 124-130, 1997.

Gutiérrez, B. et al. Soluciones colaborativas a problemas del paquete instructivo de la UNED: los aportes de learning space, quorum y correo electrónico centro de investigación académica. UNED. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo I. Editorial UNED, San José, Costa Rica, p. 298-310, 1998.

Herrera, N. El programa de servicios a estudiantes con discapacidad de la UNED, una alternativa de estudio. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 1-9, 1997.

Jussila, T. Innovative anarchism online - investigating made-in-japan virtual learning environmets. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo I. Editorial UNED, San José, Costa Rica, p. 346-3, 1998.

Kochman, A. Running head: instructional television quality. An investigation of the quality control aspects of live interactive television. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED,

San José, Costa Rica, p. 136-150, 1997.

Monge-Nájera, J.; M. Rivas R., V. H. Méndez-Estrada. Como creamos un curso híbrido entre el *web* de Internet y el libro de texto tradicional para un curso libre sobre biodiversidad. X Congreso Internacional Sobre Tecnología y Educación a Distancia, UNED, San José, Costa Rica, noviembre de 1999 (este volumen).

Nilsson, J. O., et al. Sociology in cyberspace. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San José, Costa Rica, p. 452-459, 1998.

Núñez, D. La mediación pedagógica en el diseño y producción de materiales para sistemas de educación a distancia. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 208-222, 1997.

Olmstead, P. M. Paperless classroom: meeting the de paper and postage challenge. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 204-207, 1997.

Pensa, D., G. Sabulsky. Sobre el uso de los media en los procesos de enseñanza. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San José, Costa Rica, p. 484-497, 1998.

Rivas, M., et al. Educación a distancia: prototipo de enseñanza virtual mediante una red de comunicación. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 235-243, 1997.

Robertson, W. D., D. Mattock. Partnerships, innovation and change in a small canadian university. IX Congreso Internacional sobre Tecnología y

Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San José, Costa Rica, p. 732-739, 1998.

Rodríguez, N., G. Vargas. Prototipo de autogira virtual para el curso de olericultura en la universidad estatal a distancia. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San José, Costa Rica, p. 544-560, 1998.

Sandoval, R. Proyecto: desarrollar una asociación tecnológica estudiantil (ASOTEES). IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San José, Costa Rica, p. 722-731, 1998.

Seas, J. Estudio comparativo del rendimiento académico de los graduados licenciados en informática educativa, pertenecientes a los tres grupos mayoritarios que acceden al programa (nformática, educación y enseñanza de la computación) en la UNED. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San José, Costa Rica, p. 578-591, 1998.

Torok, A. G. Push or pull? Internet support for distance education. VIII Congreso Internacional sobre Tecnología y Educación a Distancia. La Educación a Distancia como una Solución de Calidad para el Siglo XXI. Editorial UNED, San José, Costa Rica, p. 180-187, 1997.

Villegas, H. Propuesta de un programa educativo abierto: universitario y parauniversitario para el adulto mayor en Costa Rica. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San José, Costa Rica, p. 668-675, 1998.

Víquez, M. Supuestos teórico-metodológicos para el cambio del proceso de enseñanza de la matemática en la UNED de Costa Rica. IX Congreso Internacional sobre Tecnología y Educación a Distancia. Cooperación Interamericana en Educación a Distancia. Tomo II. Editorial UNED, San

José, Costa Rica, p. 676-686, 1998.

Additional references

Armstrong, G. (Mayo, 1996). Distance Learning Network Incorporates Video Presentation Stands. THE Journal, 23(1).

Baird, M. (Sept./Oct. 1995). Training Distance Education Instructors: Strategies that Work. Adult Learning, 7(2).

Barry W(1993), Distance Education: a practical Guide, ERIC Digest preparado por el autor para el “Clearing house on Informacion Recources”, Nov. 1992

Berge Z, Computer Mediated Communication and the Online Classroom: Overview and Perspectives, en Computer-Mediated Communication Magazine, Vol.2, No.2, Febr. 1995, p 6.

Bozik, M. (Septiembre, 1996). Student Perceptions of a Two-Way Interactive Video Class. THE Journal, 99-100.

Brand, M. (Otoño, 1995). The Wise Use of Technology. Educational Record, 76(4), 7.

Cotton, C. (Feb. 1995). Time and Place Independent Learning: The Higher Education Market for Distance Learning Emerges. Syllabus, 8(5).

Gates, B. (Marzo, 1996). The Connected Learning Community: Using Technology for Education. THE Journal, 10.

Gibson, T. L. y Chere, C. (Sept./Oct. 1995). Lessons Learned form 100 + Years of Distance Learning. Adult Learning, 7(2).

Gilbert, S. (Marzo-Abril, 1996). Double Visions: Paradigms in Balance or Collision? Change, 28(2), 8.

Granger, D. y Benke, M. (Sept./Oct. 1995). Supporting Students at a Distance. Adult Learning, 7(2).

Gross, R. (Oct./Nov. 1995). Defining the Future: The New Mandate for Distance Learning in the 21st Century. Community College Journal, 6, 66.

Jordahl, G. (Enero, 1995). Bringing Schools Closer with “Distance Learning”. Technology and Learning, 4, 15.

Kaye, Anthony (1989) Computer-Mediated Communication and Distance Education, en Mason R, Kaye A, (edit), Mindweave: Communication, Computers and Distance Education, Oxford: Pergamon Press

O'Keefe, S. (Octubre, 1995). Electric Texts. Internet World, 56-58.

Partee, M. (Junio, 1996). Using E-Mail, Web Sites, and Newsgroups to Enhance Traditional Classroom Instruction. THE Journal, 79-82.

Peters Otto (1993) Understanding Distance Education, en Keegan D, Magnus J, Harry K, (Edit): Distance Education: New Perspectives, Routlege USA.

Phillips, V. (Septiembre, 1996). Earn a Master's Virtually. Internet World, 7(9), 4.

Tomei, L. (Sept., 1996). Preparing an Instructional Lesson Using Resources Off the Internet. THE Journal, 93-95.

Van Horn, R. (May, 1996). Sorting it out: Distance Learning, Video Conferencing, and Desktop Video Conferencing. Phi Delta Kappa, 2, 77.

Wagner, E. (Sept./Oct. 1995). Distance Education: Success Factors. Adult Learning, 7(1).