USING COMMUNICATIONS AND MULTIMEDIA TECHNOLOGIES IN A NEW APPROACH FOR COMPUTERS IN EDUCATION IN DEVELOPING COUNTRIES

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ABSTRACT

The use of computers in elementary education in developing countries has been usually centered on learning about computers and on using programming languages and a few unproven educational software packages. Modern trends emphasize the computer as a media or as an empowering tool for teachers and students, centering the focus on the people that use it and on ways of using the technology as a means of making the school a more attractive and effective place. This paper presents a national project that is presently under way in Chile and which was designed on three basis: the knowledge about the people and schools that will eventually use the technology, the reported world wide experience in computers and education of the last decade and the new opportunities of modern technologies, mainly multimedia, communications and human-interfaces. The project started as a prototype in 1991 and will gradually expand during the next 5 years.

Keywords: Computers in Education, Educational Network, Communication, Multimedia, Human Interface.

INTRODUCTION

A major effort in education is under way in Chile. The World Bank and the Chilean Government have designed a 5 year Program whose key objective is to assist the Government in enhancing the efficiency, quality and equity of primary education in selected schools in targeted urban and rural low-income areas. Part of this large Program is a project that considers the use of computers and communications in some of those schools.

During the project's design, three major aspects were considered:

1. The chilean educational reality: its high degree of administrative centralization, a high number of rural and mainly isolated schools, poorly motivated teachers, school abandonment, low educational performance indexes, few opportunities for local innovation, etc. The cultural, geographical, social and ethnical diversity was also considered [2].

2. The world wide experience in computers in education [8] and its status in Chile was revised in order to assess large scale efforts and to look for trends in usage, training, technology and evaluation mechanisms. The last decade was regarded as one with high expectations and few significant results in terms of the role, value or effectiveness of computers in schools [1]. In Chile almost 30% of schools in Santiago have 8 bit computers and very few software. Teachers are mainly self-trained [3] [4].

3. The new opportunities of modern technology. Computers of the nineties include enhanced capabilities allowing new ways for using them in schools. In particular multimedia [5] [6] -integrating text, sound, animation and live video in a multidimensional associative space- and communications [7], allowing the work in collaborative projects among geographically dispersed schools children and teachers [8]. In this respect, many southamerican countries are rapidly improving and expanding their telephone systems, and some, like Chile, are installing large fiber optics networks.

These three considerations led us to propose the following objectives for the project:

1. Gradually develop a computer network comprising elementary schools and research centers in four chilean regions, using the public telephone system or radio. It is also expected to communicate with foreign schools using the Internet facilities as a gateway. The project has started connecting 5 nodes in Santiago and 1 in U.S.A. in 1991 and will gradually expand until it reaches about 100 schools covering a variety of cultural, geographical, social and ethnical communities. It is also expected that at least 10 research centers (universities and institutions) related to education and community development initiatives will join the network to participate in collaborative projects.

It is important to emphasize the effort on providing very simple to use human-interfaces, building an abstraction over the operating system and the communication platform. Training on how to become a computer user and how to take advantage of the communication system and the educational software will have a low profile. The experience conducted so far demonstrated that carefully chosen graphical metaphors can dramatically reduce computer training time. Training will be devoted to methodological rather than to technical issues.

2. Install an "Educational Technology" Laboratory in a regional university to support, design and stimulate the projects and activities that will be carried on through the network. This laboratory will have the resources, the people and the equipment to build and test multimedia educational software. It will be also the place where the evaluation of the experience will be carried on. The laboratory will be staffed by an interdisciplinary team, comprising software and communication engineers, teachers, psychologists, graphics designers and social workers.

THE PLAZA

The Project will officially start in early 1992 but a prototype network was implemented in Santiago comprising 6 nodes: 3 local elementary schools, the Catholic University of Chile, Apple Computer headquarters in Santiago and a school in Albuquerque, New México. The schools in Santiago were 2 public schools in low-income areas and the other one was a private high-income school.

Plazas are places well known in Spain and Latin-America. A Plaza is an attractive space for children, a place for getting together and to start interesting adventures. The following picture is a crude black and white version of the full-colored original interface.

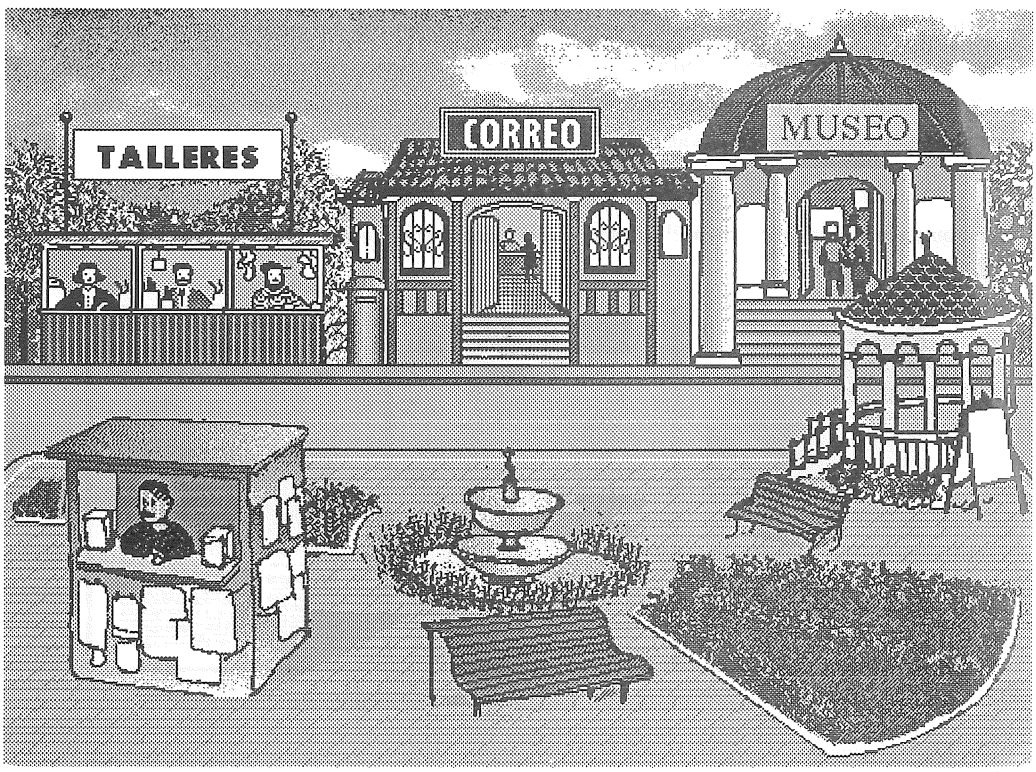

Figure 1. A b/w version of The Plaza

The Plaza is the human-computer interface that a teacher or student encounters in the computer. There are no command languages involved in using it, nor is it necessary any particular training, only pointing and clicking with the mouse. Its main purposes are to be inviting and to offer a simple window to the available functionality. Teachers and students were exposed to a short demonstration and were left on their own. In most schools, the computers were first left to the teachers for at least a week in order to allow them to get confident with the

system and prepare them for trouble shooting. Most problems and questions were solved using the e-mail system itself without having to go to the schools.

The Plaza has the following parts, each one being a well known metaphor with a particular meaning and purpose:

1. The Kiosk

The Kiosk offers a window to an information space comprising newsletters, stories and educational comics. Students can read their newspapers, which are collaboratively build by several children in different schools. They have a lively format and contain their own and also some centrally provided news. A central editor exists at the laboratory who receives the contributions from the users. Similarly, the teacher's newspaper has a central editor and contains their news and also general purpose articles. The newspapers offer presently only text and graphics and very crude animations but is expected in the future that they will contain better animations and short video sequences.

The Kiosk includes also short stories and comics as a stimulus for reading. Students are encouraged to send their own illustrated stories which, after some editing can be found in the Kiosk.

Figure 2. B/W view of newsletters and stories available in the Kiosk

2. The Museum

The museum is a friendly interface for a simplified distributed database of educational software applications and general purpose articles. Users can browse through an index and select a piece of software. If the selected material is on place, it is run for the user -generally a multimedia educational application-, if it is not, a message is sent to the central server in order to deliver the material the next day. The next figure shows a black and white portion of the Museum's interface:

Figure 3. B/W version of parts of the Museum's interface.

Presently, less than 10 applications are available at the museum but one of the project's goal is to gradually build a comprehensive library of tested software. Most of this software will be built in the laboratory in collaboration with teachers or directly by the teachers themselves. Only proven, robust and well designed applications will be allowed into the Museum's collections. Each application will have a curriculum, stating its ownership, users, experience, recommendations and whom to write to share or ask information about it. The section on general purpose articles presently contains only a few educational articles in electronic format, available to the teachers. It should also gradually evolve into an electronic library, to be used in the same way as the applications.

3. The Workshop

Teachers and students will be encouraged to work on collaborative projects (i.e. story writing, scientific experiments) and to build their own multimedia applications using general purpose authoring tools. The results of these efforts will be delivered to the museum. These activities are organized and conducted in the Workshop which contains an information space for every interest area, as in some bulletin boards. Users build their project and use the e-mail system from inside the Workshop.

4. The Post Office

The post office is presently a simple to use bulletin board. Although all letters are broadcasted to all schools, the Post is separated in two areas, one for teachers and one for students.

Users can presently write and draw pictures on their letters. The main purpose of the Post Office is to establish initial contacts with people having similar interests in order to later continue their communication under a Workshop project.

The following figure shows a letter sent to everyone ("Todos") by a group of children ("Los Bombachos") of the "San Joaquin" school the 10th of december 1991.

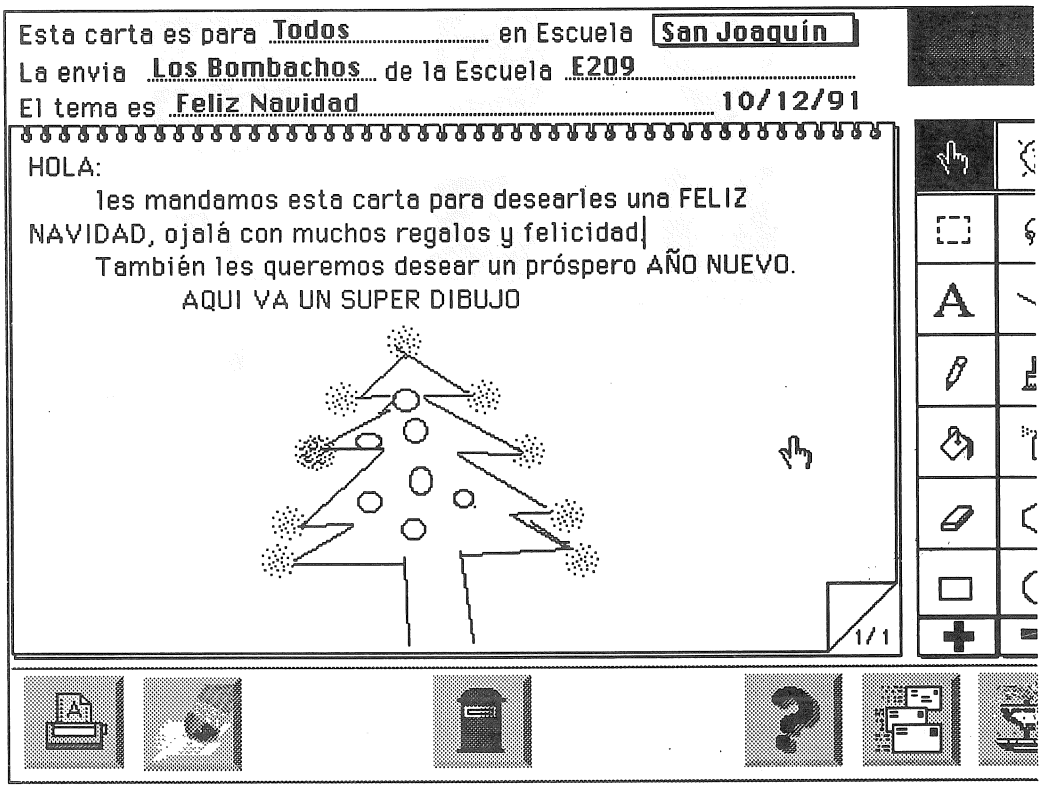

Figure 3. A b/w version of a letter sent.

ACTIVITIES ON THE PLAZA

Introducing the computers in one primary school that had never used computers was easier than expected and presented less problems than in the two schools with computers. After a 20 minutes demonstration to teachers and a 5th grade class on how to navigate through the Plaza, the users were left on their own. Most of the problem encountered were due to user-interface design flaws and provided an important feedback for the next step in the project.

Children were encouraged to establish pen-pal relations with children from other schools. This succeeded rapidly and it was proved that a well designed e-mail system encourages the reading and writing habits. After a few days of writing letters and drawing pictures, students

were participating in different activities. Some of them were playing chess across the network, working on a cultural quiz, participating in a drawing competence, etc.

Although the experience lasted for only a few months, all students and all teachers participating regarded the project as highly motivating and would enthusiastically continue in 1992. The designers goals were obtained in terms of validating the user-interface, demonstrating the usability of the public telephone system (at between 2400 and 9600 bps, most of the time) and the attractiveness of multimedia software for both teachers and students. All activities on the Plaza were recorded for future analysis.

FUTURE WORK

Future work will concentrate on several areas.

1) the user interface has to be revised, making a more lively Plaza. There are several opportunities to introduce meaningful multimedia capabilities, such as moving icons when e-mail arrives, sound or animations when newsletters are updated. The Plaza is regarded as a first step toward an "educational town". For example, a health care center will be provided to learn about personal hygiene, eating habits. Also, the underlying communications architecture will have to be improved, including more efficient ways of connecting the schools and the ability to handle larger school networks.

2) a teacher training strategy will have to be implemented using mainly short in-site workshops and the network for follow-ups. Although the software is very simple to learn, many teachers are frightened anyway, particularly if they have been exposed to older command driven interfaces. Most of the training will be devoted to methodological issues, such as how to prepare, conduct and evaluate an experience with students using computers.

3) the place for the computer at the schools must be carefully chosen. It seems that the library and the teacher rooms are strong candidates for extracurricular uses.

4) One of the toughest challenges is to develop and conduct qualitative and quantitative evaluation procedures and measurements.

5) Much effort will be devoted toward designing new collaborative projects for teachers and students with reference to their particular social and cultural interests.

CONCLUSIONS

A national project on computers and education in Chile has been presented. The project started with a small prototype and will gradually expand until it reaches at least 100 nodes. The project's assumptions that an attractive and simple to use software platform encourages the meaningful use of computers for stimulating reading and writing and for working on collaborative projects integrating areas of knowledge was partially validated during the prototype. Eventually, the project's final objective is to make public schools a more effective and attractive place for teachers and students regardless of their social, cultural or geographical situation.

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