Human-computer interface for educational software: an electronic communications software implementation

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ABSTRACT

This paper presents educational (telecommunication) software specially designed for school environments. The software was designed for nontechnical users. The paper analyzes user requirements and describes examples of the solutions implemented in the software. The software was built as part of the Enlaces Project (Educational Chilean Network) and is called 'La Plaza'. It is currently being used by 70 schools.

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INTRODUCTION

With each day the importance of computer based communication systems for interpersonal worldwide communications is growing [1, 2]. Among these systems electronic mail has become a basic tool for communication between individuals and working groups.

In the last decade the number of international data networks users, mainly electronic mail users, has grown exponentially. Nowadays there are more than 146 countries connected by email [3] and there are many efforts under way to connect other countries.

This tremendous growth in the use of electronic mail is facilitated by a mature technology which supports computer communication. It has allowed easy expansion and interconnection of the current international computer networks (Internet, Bitnet, Usenet, etc.).

On the other hand software tools for electronic mail are still closely bound to academic or technical environments. Also this incredible expansion has not yet reached private homes, schools and commercial sites which are not bound to the world of technology. There is therefore still a gap to be filled between this technology and ordinary users [4].

This paper presents Project Enlaces which has tried to bridge this gap by developing an easy to use user interface especially designed for educational environments. This interface is embedded in software called 'La Plaza' which is used as first introduction for teachers and students in the world of computers and communications [5]. 'Enlaces' ('links' in English) is a pilot project which forms part of the Program for Improvement of Educational Quality (MECE) of the Chilean Ministry of Education. This program seeks to have a long term impact on the quality, equity and decentralization of Chilean education. Through the Enlaces Project the MECE program may bring modern computer technology in the country's poorest schools.

The Enlaces project has been in operation since 1993 at the Universidad de la Frontera in the region of La Araucania in the south of Chile. The goal of the project is to shed light on the use of computers in primary education. Between 1993 and 1997 a computer network gradually has been installed at 150 rural and urban primary schools. Furthermore an Educational Computing Centre was established at the university to design educational activities, produce materials for the schools and administer the network. Today more than 70 institutions are connected where teachers and students exchange experiences through computer based communication tools.

INTERFACE REQUIREMENTS AND PROPOSALS

Enlaces Project has been working with communication tools in primary schools for the last three years. We have found that one of the big barriers for the use of technology, particularly software and communication tools, by students and teachers is an inadequate user interface and inadequate functionality [6].

Some of the main requirements in the design of a user interface for educational software and electronic mail are: ease of use, pertinence and flexibility [7, 8]. How these requirements were met by Project Enlaces is described in the following.

Figure 1 shows part of the La Plaza software which is the proposed interface for communication activities inside Chilean schools and for software access.

Fig. 1 La Plaza

Ease of use

Much of the existing software for education and communication requires some kind of technical knowledge for installation, use and administration. This fact intimidates users at schools, most of whom have never had access to computers. It is essential to avoid most of the technical barriers. The goal is to offer a simple and intuitive system to the user who can then concentrate on the real task (i.e. use and communication) and not on configuration details like transmission rate or modem protocol.

The proposed user interface for electronic communication uses a graphical interface with direct manipulation [9] and commands can be given through icons on the screen. Figure 2 shows the implementation of these concepts. It is the environment used to compose electronic messages which is visually presented as a notebook and a postal envelope. All the user actions are activated through

the use of the mouse over the corresponding buttons (a post box to send the message, a printer to print it and so on).

Fig. 2 Pencil for e-mail

One challenge in the 'ease to use' approach to software interface design is to minimize the training effort involved in the process of technology adoption in the schools. In the three years of experience several training strategies have been tested. The one we are using now consists of self-guided workshops which run in each school. The teachers practice in groups using the La Plaza software to familiarize themselves with its options for use (multimedia navigational aids) and communication. The second phase of training consists of teachers in the different schools using the network to get to know the projects of other schools and letting other schools know about their own projects; this aims to establish ties among teachers with similar interests. Finally the teachers train their students in the use of La Plaza.

With the new schools which are being incorporated into the network, we are shifting from a user-interface-use training to a pedagogical-use-of-software training investing minimal time in issues related to the user-interface.

Pertinence

A lot of software, even if it is easy to use, is not adapted to the real needs of the end-users in this case teachers and students from primary schools. If the software is pertinent to the reality of the user, it will help to eliminate access barriers and will immediately make sense to the user. In this respect Enlaces Project finds important the use of images and metaphors which are familiar to the user and based on the Spanish language [10, 11]. Another particular consideration for school environments is the need to deal with multiple users

with access to a limited number of computers. This suggests the use of public mailboxes in the computers of each school for groups of users without passwords. This is an obstacle to privacy, but facilitates management and exchange of information inside the school.

The proposed interface uses metaphors which are related to Chilean school environments with images of children and adults in familiar places typical for many Chilean towns. As an example the Post Office interface is shown in Figure 3. It is a building with kids and adults around panels containing the different 'electronic mailboxes'.

Fig. 3 Post Office building

The Post Office is a simple electronic mail system for children and teachers. The goal is to have an informal means to first establish contact and later go and join a working group in the Cultural Centre (Fig. 4) or simply exchange ideas and opinions on subjects of general interest.

The children use this Post Office in their schools daily writing letters with text and drawings about diverse topics such as how to make friends, how to tell fortune, how to play chess, to talk about what motivates them, to talk about pets, etc. Sound and graphics are presently being explored in prototype versions. The final goal is to allow children to compose a multimedia document and to send it through the network. For this purpose the network's communication platform is based on the MIME standards for multimedia messages over SMTP [12].

Teachers initially use the Post Office rather tentatively since it is generally perceived that the use of telecommunications requires patience and that teachers take more time acquiring the habit of exchanging experiences and establishing contacts with colleagues on the network. This is a global

phenomenon and although the use of computer networks is currently exploding in the developed countries, it took several years for the medium to be accepted there by teachers in different educational communities.

Fig. 4 Cultural Centre

Besides the school-to-school mail found in the Post Office there are special mailboxes for public interest lists like the ones found in the Cultural Centre Building shown in Fig. 4.

The Cultural Centre is a meeting place (basically a simple to use bulletin board) for developing collaborative projects among the students and teachers at different schools. It is also a place to establish communication among teachers with common concerns and for them to exchange experiences, written work, opinions, etc. There are for example groups with a common interest in physical education, mathematics, English, literary workshops, communication with other countries, etc. The graphic design shows groups of people working together in a familiar Cultural Centre environment and attitude.

The last example of the pertinence of the software is the Kiosk (Fig. 5). It offers a window to a space where dynamic information can be found. Multimedia based newspapers for students and teachers are found there (with text, graphics, sound, animation and video clips).

The goal is that these documents will be in constant, noncentralized production by the teachers and students themselves. This gives an additional level of pertinence, i. e. the content of the software is also relevant to the network community because it is produced by themselves.

The Kiosk also offers short multimedia based educational stories and vignettes as a stimulus to reading and writing. Through the Kiosk the children can write and illustrate stories and offer them to children in other schools,

something which motivates and entertains them and reinforces their self-esteem.

Fig. 5 The Kiosk with its newspapers and stories.

Flexibility

In environments like education diverse projects and needs let interface requirements vary in time. Newspaper projects where articles are published on some special electronic format (colour, shape, etc.), are an example (Fig. 5). Also there are so many different media of information which today's computers can manage (sound, video, image) that one can start to think about tools for managing these data type in electronic messages.

The proposed software allows the use of different masks over the basic interface in order to be adequate in particular situations. In this context the concept of 'Pencil' used in the Post Office (Fig. 2) is reused with some modifications for news articles in electronic newspapers inside the Kiosk building (see Fig. 6). This economy of concepts facilitates the use and reuse of the software at the schools by the teachers and by the new students which will come each year.

EXPERIENCE OF USE

For the last three years the Enlaces Project has had experience with electronic mail in primary schools. Different email prototype interfaces have been field tested with real users during these experiences. These prototypes have evolved to the version which is currently in use and is used in frequent communication

between more than 70 schools distributed in the cities of Angol, Collipulli, Santiago and Temuco in Chile.

All the traffic is continuously monitored for statistical research on the network and the user interface evolution. It allows us to know, for example, that in 1994 more than 700 messages per week were exchanged among the schools and that at each school the Post Office is used an average of 20 times a day and that the user stays there for about 10 minutes each time. Many of the messages processed through the Post Office are part of educational projects developed among teachers and students from different schools. Other messages are sent to open forums, discussion and interest lists like the one showed in Figure 4.

It is still early to make a complete objective evaluation of the software, but the success of the communication among schools is an indicator that the email interface is developing in the right direction.

Fig. 6 Newspaper Articles v/s Post Office Pencil

FUTURE WORK

The user interface for educational software and electronic mail is the first step in allowing ordinary users friendly access to computer technology and communication. Work on it will continue as the feedback is received from the current users in order to make it more ease to use and pertinent to their realities. The goals will be accomplished when the software design offers an adaptable set of basic modules which provide the functionality necessary to create the communication environments needed.

The next step is to try to go further than electronic mail communication and provide access to electronic information bases and on-line services and software supporting collaboration.

CONCLUSIONS

Enlaces project has demonstrated the importance of focusing the user interface development on the key points of ease of use and pertinence. The design of the software permits reuse of concepts in a flexible user interface which is based on reusable software modules.

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