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TeleCAI: Easy to implement, difficult to adapt to ?

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Summary

In period 1993 - 1994 an experiment is conducted at the University of Amsterdam to see whether TeleCAI can be used to extend the scope of CAI in higher education. TeleCAI, or the use of Computer Assisted Instruction in a context of Distance Learning, can lead to a more flexible use of educational materials, more freedom in study behaviour, and at the same time guarantee a regular student-supervisor contact. Starting as an experiment, existing statistical courseware was extended with a procedure to enable the exchange of progress data, e-mail and updates of the courseware by modem. Prerequisites of this procedure were that the interface should be easy to use, and that the courseware used in a TeleCAI setting should have the same functionality as the courseware in the traditional setting at the University. Minor changes to the courseware were made (but not necessary) to exchange data from the computer of a student to the file server at the university and vice versa. Students are very enthusiastic about this new opportunity, and the demand to join the experiment exceeds the number of TeleCAI sites significantly.

Though the implementation -both of hardware and changes to the software- is relatively simple, and the experiment can be considered successful, some problems are noticed with regard to the study behaviour (lack of planning/regular study behaviour) of students in a TeleCAI setting. Some measure are discussed to overcome these problems as the Faculty is looking for ways to extend the use of TeleCAI in the curriculum.

keywords: Computer Assisted Instruction (CAI), E-mail, Distance Learning, TeleCAI.

1. Introduction

Each year, 500 to 700 freshmen enter the Faculty of Psychology of the University of Amsterdam. To guide students in their work, CAI is developed as a complement to the lectures. Development started in 1988, and since then 10 CAI programs have been developed, resulting in 20,000 contact hours each year. Though the emphasis is in the first year, CAI is used throughout the whole curriculum. Subjects covered by CAI include learning to use general software packages (word processor, database applications, statistical applications), statistics, (psycho-)diagnostics, judgement of non-verbal behaviour, and the use of electronic equipment in psychological measurement. Building upon the large body of knowledge regarding CAI at the Faculty, both in the field of development and use of CAI, plans to start using existing CAI for distance learning rose in 1992. A project was started in November 1992 to test the feasibility of different aspects of distance learning; apart from TeleCAI as described here, the project included the creation of a campus wide information system and distribution of CAI over the University Network (internet). The primary goal of the project described here is to investigate whether the CAI used at the Local Area Network (LAN) of the Faculty could be made available to students working at home with their own computer and modem. An important aspect that was considered was that the communication between supervisor and students should be optimal, at the same time enabling student-student contact by e-mail. The functionality of the courseware should be the same at home as in the traditional CAI setting. The advantage of having CAI available at the campus as well as at home is that students can plan their working hours in a more flexible way. It is anticipated that in the year 2000 the majority of the students will have a computer at home at their disposal (Alvegård et al, 1992), and provided they do, they are no longer dependent on the limited computer facilities at the university. From the university's point of view, more students having a computer themselves could mean a reduction of computer facilities at the faculty, meaning a reduction of costs.

The approach chosen was one of small scale introduction of TeleCAI. An experiment at the Hogeschool Utrecht (see: Bakker, 1991) pointed out that an abrupt introduction of TeleCAI could

lead to problems (Schellekens, 1992). The purpose was merely to develop a procedure that makes it possible for students to use every CAI program that can be used at the faculty in a TeleCAI setting, without having to rewrite all courseware.

2. Courseware

The course that was used for the first experiment was a course on statistics (Dr. Star). The course consists of 20 modules, each one covering a subject in the field of introductory statistics. The subject covered is introductory statistics: basic concepts and techniques of descriptive statistics, probability, and testing theory. Each subject is introduced with an example, and only after becoming familiar with the relevant concepts the formal presentation is worked out. During the extensive explanation of the concepts the comprehension of the student is constantly tested; apart from that there is a large number of questions and a separate test module (Dr.Exam). Though the course is set up as a tutorial using mastery learning, students are allowed to skip parts of the course. It takes about 10 hours to complete Dr. Star. The course has been used at the faculty for four years, and has proven to be very effective and stable, making it possible for students to work without any guidance. In the traditional CAI setting, the course files and all student data are stored on a file server. Students can contact the supervisor by means of integrated e-mail (Balk, Bierman, van der Horst, 1992), the supervisor can answer questions by e-mail immediately, and has the possibility to integrate small program statements that are then executed by the e-mail interpreter (e.g. skip the current question, restart the course, enable the option time-table, go to page n.r.x.).

In the TeleCAI project, Dr. Star had to be adapted to the TeleCAI situation. Because the software takes up about 10 MB of disk space, it was not possible to download all courseware on each session. Therefore, the course modules were installed on the Hard Disks of the student computers. In this situation, it would be possible to work completely off-line. But it was perceived to be essential to keep contact by e-mail, and to keep track of student progress by storing progress data centrally on the file server. Instead of adapting all IO-routines of the courseware, a central routine was implemented that takes care of copying data from the Hard Disk of the student computer to the file server and vice versa. At the beginning of each session, students can choose to make contact to the file server. If they choose to do so, a script is executed that (a.o.) copies all relevant files (modules, messages, data) between the file server and the student computer.

In a second phase of the project, the TeleCAI routine using a script is made more general in a way that it can be used with any of the CAI programs that are used at the faculty.

3. Technical implementation of TeleCAI

3.1. Hardware

The courseware is delivered on the Apple Macintosh platform. Course files are stored centrally on a file server, and 40 student computers (Macintosh LC) are connected to the file server in an AppleTalk network (LAN). To enable contact by means of a modem to the file server, an ARA server is connected to the network, having 8 parallel lines with 14,400 baud modems. Using ARA (Apple Remote Access) students are able to contact the university network and mount the file server. Any file transfer between the file server and Hard disk of the student computer can then be done in the same way as a local file transfer.

A limited number of students could borrow a simple computer with hard disk (Macintosh plus) and a modem (ranging from 2400 baud to 14400 baud) from the faculty. Students that already had a Macintosh computer and modem could install the program (Dr. Star, ARA) from a set of disks. Five computers plus modems and two extra modems were available, 32 students joined the experiment.

Because there is no internet connection and passwords to contact the ARA server were hidden from viewing, no special safety measures were thought necessary to safeguard the LAN from illicit use.

3.2. Software

To be able to use standard CAI programs in a TeleCAI setting, two programs are necessary. The first program is ARA, or more specifically ARAClient. This program can be configured as a connector that stores the phone number of the ARA server and the name and password of a specific user. Running the program will result in a connection between the computer and the ARA server of the faculty.

The second program mounts the drive that is used for CAI, executes a script that is stored on the file server, and then dismounts the drive again. The script can be varied by the supervisor, but in essence it copies all data and e-mail files from the student computer to the file server, and copies messages for the specific student and if necessary updates of the software back. Because we have integrated this program-code into the registration module of our courseware, we choose to use the scripting language of the authoring system (Authorware Professional). The script can be used to read, write, append, copy and delete files, assign values to variables and use conditional statements. A variant of ARAClient (called 'ConnectNot') finally disconnects from the ARA server. This combination of two programs, including the flexibility of the scripting language, makes it possible to have the same functionality at home compared to the traditional CAI setting. The CAI programs do not have to be changed; what is necessary is a scripting language that defines which files are essential for normal supervisor-student and student-student contact and should be copied.

3.3. Procedure

Only a limited number of computers were available in this project (5 computers plus modem plus two extra modems per semester) and only students who registered first could borrow one. 32 students joined the experiment. The software was already installed on the hard disk of the computer, and students received a small manual that explained how the computer and modem should be connected, and how the program (Dr. Star) should be started. Dr. Star is self-explaining and needed no further comment. ARAClient could give some problems (e.g. error messages like 'the modem does not respond'); therefore almost all possible error messages plus a comment on how to solve the problem were listed in the manual.

Students that had a Macintosh computer themselves could borrow a modem. These students had to install the software themselves; all steps necessary for installation were explained on a single paper.

4. Evaluation of Tele-students

Data are still being collected at this moment, and a full evaluation will be presented at the conference. Preliminary results indicate the following:

- Students are very enthusiastic about the possibility to work at home. Many students indicated that they wanted to join the project, and students who had the opportunity to work at home (after borrowing a computer, or because they had a computer themselves) liked this new way of attending the CAI course.
- Only the first version (first semester) had some technical problems: students did not have the possibility to work off-line, and contact to the file-server was established after each IO operation (sending mail, saving data, reading messages). This resulted in too much delay during short sessions, and a second version allowed students to choose at the beginning of a sessions whether or not a connection should be made.
- Costs associated with contact by modem are relatively low. In normal situations, only small data files and messages are transferred. Depending on the communication speed and residence of the student, costs vary between \$5,- and \$25,- for the total course.
- Students working at home seem to have a less regular working habit. Though some students worked hard and finished all modules of Dr. Star, many students indicated to postpone their work. As a result, those students lacked time to finish the course, and some of those students failed their exam. The effect of selection of students could be important, and will be examined by means of interviews. Students were not randomly assigned to the TeleCAI project. Instead, selection was based on registration sequence. Currently, the effect of regular guidance is examined; the different attitude towards working method of Tele-students, and ways to improve those methods will be an important part in the evaluation of the results.

5. Discussion

Using modern tools, it seems relatively simple to use existing courseware for distance learning. Using a combination of communication software (ARA/ARAClient) and a scripting tool, it is possible to exchange all relevant files between a computer installed at a student's home and a central file server. Preliminary results of the TeleCAI project at the Faculty of Psychology indicate that it is possible to set up a general procedure to complement locally distributed CAI with TeleCAI. What is more important, students are very enthusiastic about the possibility to work at home, and both installation of computers/tools, and working with the communication software do not pose any

serious problems. A problem that does seem to occur is that some of the students working at home seem to have difficulties regarding the planning their work. More data will be available summer 1994; suggestions about the possibility to improve working methods of Tele-students will be discussed after that.

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