

THE PAPERLESS CLASSROOM

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This paper is in preliminary form and should not be quoted without explicit consent of the authors. The author is grateful for the assistance of Ms. Sandra Ayee and Edward Teplitz, as well as the suggestions of Profs. D.H. Bao, T. Harris, and N. Preis of Columbia University. Comments are requested.

ABSTRACT

This paper describes an experiment in integrating computer support tools into accounting instruction. Two elective MBA level courses that involved computer usage were supported by an integrated computer environment. The integrated support system involved: (1) word processing for case writeups and evaluation, (2) electronic mail usage for faculty-student communication, (3) electronic office hours, (4) electronic exam mode, and (5) other miscellaneous computer usages.

The paper introduces the key issues, describes the "paperless classroom" environment, the courses in question, the data processing tools utilized, some student reaction and is concluded by some evaluation, extrapolation and suggestions to accounting faculty.

1 Introduction

The advent of computers has been heralded as a major boon for education and pedagogic methods. The early enthusiasm for computer aided instruction had slowly faded away giving way to a more sober view of data processing in education.

In the early 80's, however, computer usage cost-benefit tradeoffs changed considerably. Hourly connect costs for shared usage decreased dramatically, and the mushrooming of microprocessors introduced a new approach to computer-based instruction.

Among the many areas of data processing that can help the instruction process, a few may be highlighted: word processing, electronic conferencing, electronic mail, instructional softwares, etc. Computer-Assisted Instruction (CAI) (Groomer, 1981;McKeown), another tool of great value, is not discussed in this paper.

Without explicit attempt of rigorous measurement of student learning, this paper describes a skeleton of computer based instruction and sketches out pros, cons and student reactions.

2 The Environment

Instruction progress management and grade control are major concerns for faculty and students alike. The methodology described in this paper attempted to use the computer in a creative way to help management and performance in the classroom

environment. Intrinsic to this was the management of the paperflow in the classroom and the incorporation of computer tools into the learning process.

2.1 Key Objectives

The literature is rich in perceived difficulties and prospective uses of data processing in teaching. Among these difficulties, a few, relevant to this paper may be highlighted:

1. There is too much paper flowing through the classroom and the instructor's desk and briefcase.
2. Assignments get misplaced or are claimed when never handed in.
3. Grading takes too much time and is heterogeneous.
4. Exams are seldom a learning experience.
5. Instructors often forget student communications.
6. Student's assignment are often sloppily presented, poorly spelled and difficult to read.

Examining tool availability, the difficulties in course management mentioned above, student learning objectives, course topic coverage and learning opportunities, the following objectives were stated for computer based classroom support.

1. Total elimination of paper flow.
2. Students hand-on experience with office automation tools.
3. Decrease in student computer phobia.
4. Easing and standardizing the grading process.
5. Simplification of the course management process.

2.2 The Paperless Classroom

The above objectives led to the development of an instruction support system which is here conceptualized as the paperless classroom, and described in Figure 1, where: (1) assignments are prepared using word processing, (2) delivered through electronic mail, (3) student-faculty communication are formalized through electronic mail, (4) office hours expanded

through teleconferencing, (5) exams administered through an electronic quiz system (6) grades assigned through a grader system and (7) assignment feedback are returned through electronic mail. Further details of each of the element and potential enhancements are dicussed later in this paper.

2.3 The Courses

The methods of teaching and course management described in this paper were attempted in two different graduate level courses; the first an an Accounting Information Systems (AIS) course was an in depth case study analysis (Romney, 1984) of various corporate accounting systems, the second an Advanced Audit (AA) course involved principally internal control evaluation, computer audit and the usage of generalized audit softwares.

Both courses were computer oriented allowing the integration of the computer into its every aspect not only as a learning tool but also to provide insights in the topic coverage.

In the AIS course, course work consisted primarily of case study analysis and decision making. Students were required to evaluate twelve and submit solutions to eight different problem scenarios. Although the majority of cases dealt with designing and implementing an accounting information system for the company involved, they were all quite different in nature. Students were required to write up all their assignments using a word processor on a mainframe and mail in their results for grading.

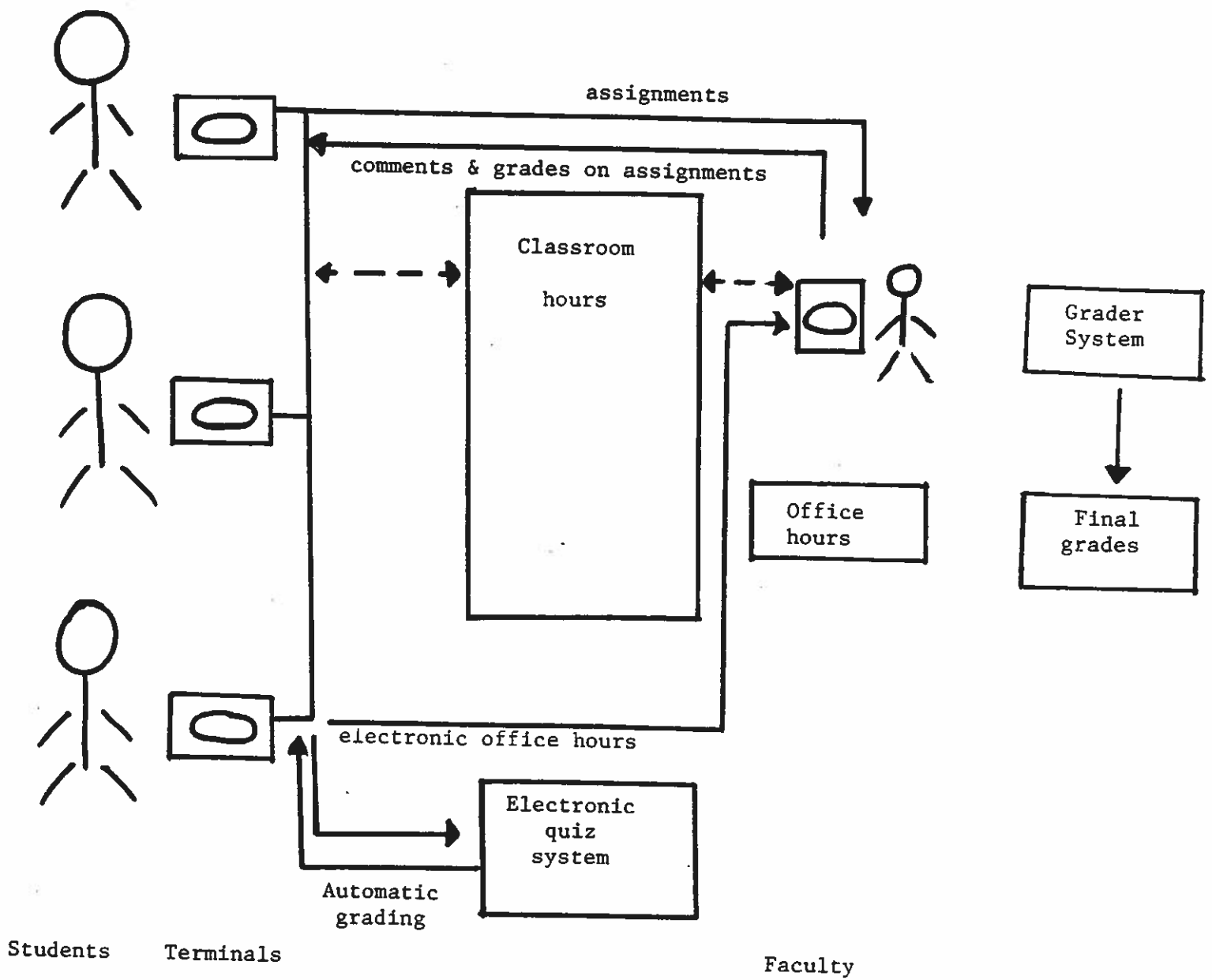
In the AA course students were assigned the task of designing and implementing generalized Audit Software based application Audits. Projects ranged from a selection of different selected fields to an intensive evaluation of an application file. Again, all assignments and out of class communication were precipitated on the computer.

The following section describes each of the computer based tools used in the process.

3 Computer Based Tools

The computer environment was predominantly mainframe time-shared with the instructor having a class account, a class library and each student having their own account. The DEC 20, under the TOPS 20 operating system, allow such an account arrangement and common user library identification codes (e.g., BUS8107.*) for all users related to a particular course. This

Figure 1: The Paperless Classroom



arrangement, as mentioned later in the paper, allows limited bulletin-boards, file sharing, and broadcasting.

A few students had their own personal computers and used these from home in a terminal emulation and/or file-transfer modes. This same mode of operation was also used by some students from the public micros of the computer room.

3.1 Word Processing

All students were requested to prepare their cases and other assignments on a Word Processor. A simple, line-by-line (OTTO) and a full screen (EMACS) word processor were suggested for use. A short introductory lecture and computer center documentation were given to the students who were directed to online tutorials

1 on the usage of word processors. SCRIBE and RUNOFF were offered as formatters but were not required. ISPELL was demonstrated and recommended for use as a spelling aid. Despite some initial difficulties, by the end of the semester, most students had a good handle on word processing, were using the speller, were using the formatter, and many were investigating or have acquired personal computers with word processing.

3.2 Electronic Mail

The "MM" facility of the DEC 20 was used for electronic mail. Figure 2 displays a sample of the access and receipt of information using electronic mail. Students were required to formalize all communication through written messages, and to submit cases and other assignments by electronic mail.

At first the mail flow was very sparse but as the term progressed it became more intense. An average of 7 messages or questions were transmitted per student over the course of the term. Mail ranged around many topics. The majority fell within the following categories: 1) Final project topics for instructor comment and approval, 2) More information and general guidance on the case studies, 3) Grading, 4) General questions and remarks related computer use and, 5) Administrative issues.

Computer messages tended to be concise, direct, to the point. They could be stored for later access and reply. They had annotations on whether they had been replied or not. They

1

These online tutorials are a form of CAI.

Figure 2: Sample MM Communication

```
MM>h a          [Faculty user requests headers]
1) 3-July Chat   (420 Chars)
2) 7-July Grade (1020 Chars)
3) 11-July David B. Boris Databases (924 Chars)
MM>send         [Faculty user sends message]
TO:  BUSIB-P.CHAT
CC:  D. BORIS
SUBJECT:  DATABASES

Peter and David:

You should look into CARDENA'S book on databases (see course
outline) for principles of relational databases.

Cheers,

Your Humble Instructor

C
Z

S>

BUSIB-P.CHAT [OK]
BUSIB-D>BORIS-D.BORIS [OK]
MM>QUIT
```

substantially helped to reduce the total time spent on office hours. They helped in the formalization of the student and faculty interaction.

As many of the instructor's transparencies were prepared on a micro-based word processor, they could be transferred to the DEC-20 and broadcasted to all students through a restricted B-BOARD. The course outline was kept online for multiple and immediate access. Changes were pointed out through broadcasts to students that queried the outline at their own pace. Case due date reminders and other notes of interest (e.g., about a local computer show) were also broadcasted to the class.

3.3 Electronic Office Hours

Throughout the term, electronic office hours were progressively incorporated into the courses. Students were allowed to ask questions or make comments through the computer, at pre-set electronic office hours. This could be performed through the "Talk Mode" of the DEC 20. These hours were held in addition to regular office hours and very seldom used. In addition, teleconferencing (Kerr, 1982), on specific topic clarification was set up on an "ad hoc" basis. The technical aspects of teleconferencing intimidated the students who seemed to prefer face to face office visits. A "practice section" on the use of "talk" did not change substantially this situation. Figure 3 illustrates a short "talk" session.

3.4 The Electronic Quizzes

During the course of the term two computerized quizzes were given. Students signed up onto the computer and were told to call up the exam file. They proceeded at their own pace and upon completion received their result. This system allowed the students a quieter and more relaxed atmosphere by which to take an exam, and the instructor no manual grading.

Pedagogic evaluation is one of the most cumbersome parts of the evaluation process. Students and faculty alike dislike the process. Students often feel at loss or unfairly evaluated. Faculty dislike the enormous workload, tediousness and repetitiveness of the process.

Qualitative evaluation of written open ended questions still cannot be integrated into generalized software support. Open ended questions and discussions require faculty reading and evaluation. An interesting feature of EMACS, which allows for windows, helped in case evaluation. While one window contained the student's case, the second was used to prepare comments and

Figure 3: Teleconferencing Illustration

[Link from GSB2.M-AV, TTY 26]

[Location SS10 #6, LA36]

@talk 34

[Link from GSB2.M-AV, TTY 33]

[Location SS10 #5, LA36]

@rem

End with CTRL-Z:

hello Professor, this is ken.

How are you Ken?

I'm fine. I have a small question to ask of you.

go ahead...

I'm in the market for a PC and would like to know what you think about the IBM PC and the Apple Macintosh.

Well Ken, the machines are based on very different architectures and will not run the same software. The IBM PC has thousands of programs and software packages available whereas the Macintosh is still fairly new and lacks the variety of software packages.

I see.

Prof. this is Serge. Don't forget to mention that there also exist many adapter boards which will fit into the PC's expansion slots.

These allow the IBM PC to run a large variety of external hardware including plotters memory which the Macintosh doesn't allow.

Thank you Prof., see you in class tomorrow. Ken.

Bye Ken.

Bye Serge.

C

Z

@break

notes to be returned to the student with the case's grade. Once the case was graded it could be "REPLIED" immediately to the student with little effort.

On the other hand, objective questions, either multiple choice or fill-in the blanks, are quite adequate for some purposes and the process of its administration and grading can be substantially automated.

2

The EQS (Vasarhelyi, 1984) allows students to access and answer questions. Randomly selected and ordered questions from an encrypted database, with subsections related to topic coverage, are given to the student. Student responses, dialogue and grades are written out to the instructor's account. If a large enough database is available students could run practice sessions prior to the exam. In this case, however, students took the quiz all at one time, to avoid exam contamination. The immediate feedback MODE of the EQS was not considered as useful in the environment.

This testing method can best be summarized by the following student's comment, "it was the best accounting exam ever; I didn't even have to sharpen my pencil!"

3.5 GRADER

3

The GRADER system picks up grades placed on a file and helps in the grading process. The system interactively gives distributions of each component grade and requests the weight for each of these components. Students are sorted based on the summation of the weighted average of the student's grades and the faculty member establishes the breakpoints. This process is repeated until the faculty member is satisfied with the GPA and the grade distribution. The last step encompasses a listing of

2

The Electronic Quiz System is written in APL and available in different versions for a DEC 20 and an IBM PC; academic institutions may request it directly from the author at cost.

3

This system is written in APL and is available upon request.

4

A less complex, but useful aid in grading and learning is the usage of spreadsheet software (Thomas, 1983).

final grades, marks on breakpoints and the possibility of interactive grade override prior to grade list printing. Figure 4 displays the use of grader.

3.6 Other Issues

With the inevitable introduction of a personal computer in most households, the skills learned in these courses are of great value. Students will now be able to take advantage of this state-of-the-art knowledge to both personal and professional gain. personal and professional gain.

In these courses students learned the differences between mainframe time sharing and the use of personal computers. They realized the positive and negative aspects of both, and discovered ways to incorporate the two means (e.g. telephone modems). Students quickly learned that they could do their work at home and then connect to the mainframe in order to relay their completed results. They were able to extend the workplace to both their home and the homes of their customers.

4 Student Utilization and Reaction

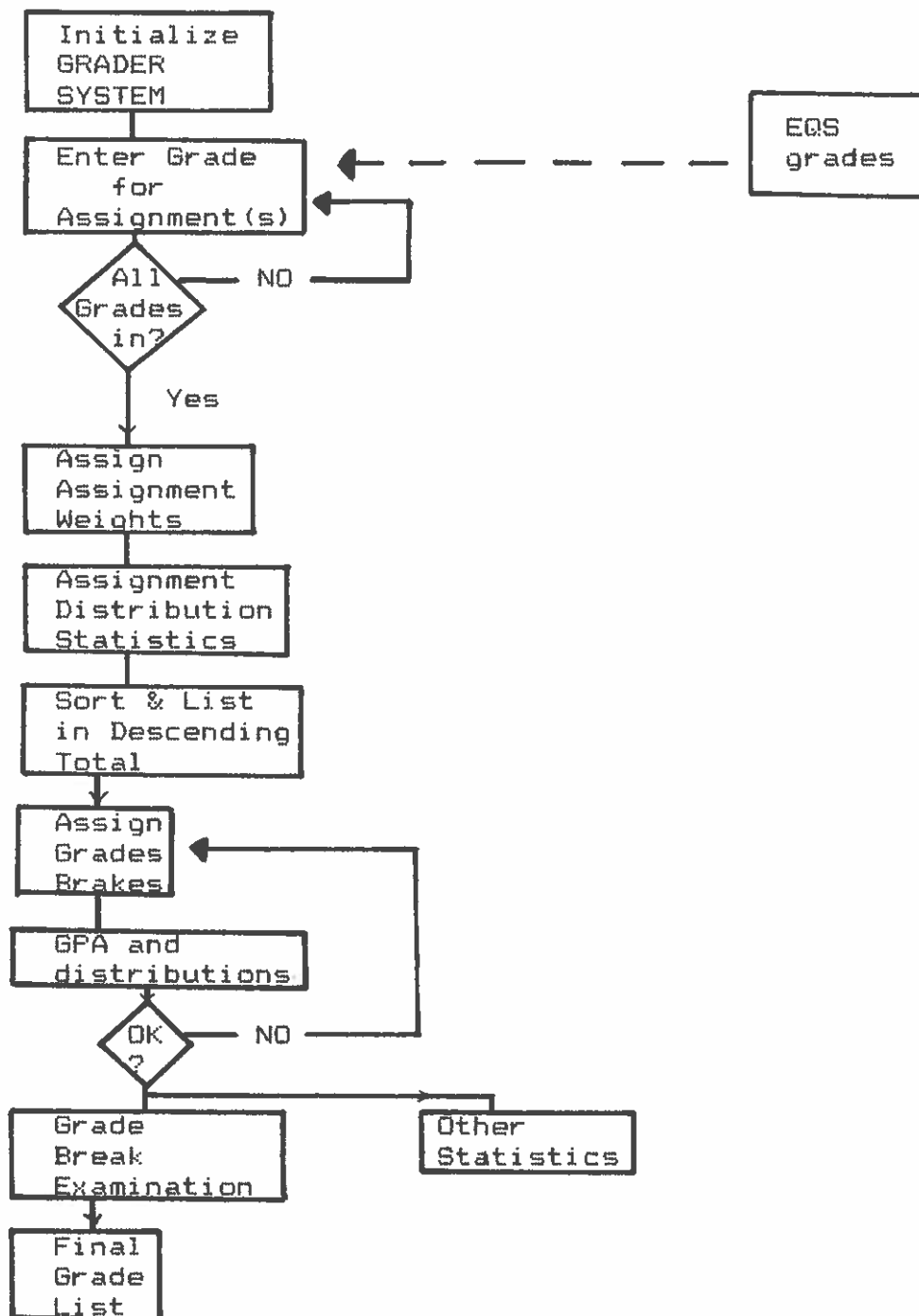
Both courses were evaluated through the standardized evaluation form used regularly in the University. Both courses' overall ratings fell into the higher 10% of the school's courses, a result about 5-10% above the instructor's averages.

Students thoroughly enjoyed the word processing / electronic mail environment. In addition the electronic mail communication, once mastered, substantially decreased the confusion of communications, and the distribution and receipt of assignments. The electronic office hours feature was seldom used. The reasons for this result are not clear and substantial research is needed.

The EQS received mixed reviews. Most students openly and directly opposed the usage of an immediate response mode where answers would be given immediately after the question. Most students were positive about the examination method but not-too-enthusiastic about the multiple choice, fill-in-the-gap mode. Unless there is an appropriate mix of cases (for idea development and expression of communication skills) and this reading assignment verification procedure serious reservations could be raised in its usage within a Graduate School environment.

Appendix I presents some selected extracts from students' comments on aspects of the course(s). A separate questionnaire

Figure 4: The Grader System



was administered for EQS evaluation and suggestions for improvement. Table 1 describes and classifies the usage of electronic mail by the students of the AIS course.

Table 1: Message Frequency and Classification

Communication Topic	Frequency
Grades	10
Questions Re: Class Project	27
General	29
Info. about cases	17
Cases submitted	88
Case grades / evaluation	79
Humor	4
Term Project Submission	7
Communication Problems	22

5 Conclusions

Introduction of new teaching technology by definition generates enthusiasm. Once the novelty wears off, the serious issues must be faced. Tentative conclusions indicate: (1) the elimination of paper flow is highly beneficial (2) the electronic quiz system has limited pedagogic value but is very valuable in a few uses, (3) once students get used to electronic mail they don't want to revert to the old way of doing things and (4) the jury is still out on the value of teleconferencing and electronic office hours.

With the widespread dissemination of microcomputers in Universities the experiences described in this paper will become the norm and not the exception. Most course environments will be adapted to the hardware / software and norms of the institution. Instructors will thrive if they can use these to their main advantage and will pay dearly if their methods do not change.

The main upcoming needs are:

1. Good instructional softwares for CAI.
2. Natural language oriented softwares for grading, assignment verification and self testing.
3. Course management softwares.
4. Methods of stimulating (Hopewell, 1984) faculty computer usage.

I. Some Selected Student's Comments

Entire course was "on the computer". Electronic mail and EMACS good - learned a great deal from that.

Liked most of the course was using the computer.

Liked most the application of the computer and information technology to the course.

Learned a lot about computer. Hands on experience is excellent.

Broad topic. Hands on experience with EDP auditing. True "State-of-the-Art" course.

My "APPLE" misses those warm case nights.

Problems with the EQS "freaked" me out.

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