Computer Planning Board
Educational Subcommittee
Implementation Plan

Electronic Studio Plan

for

Natural Sciences

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DIVISION PLAN FOR EDUCATIONAL COMPUTATION

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1. Introduction

The philosophy of the Science Division for educational computing is that an environment should be created that enhances the student's ability to become engaged in the real intellectual pursuits of their discipline and raises the level of discourse between professor and student.

This philosophy translates into the following general goals:

a. To enhance learning by providing students with computing tools that allow them to solve problems and explore processes that are otherwise too complex or intractable.

b. To prepare students for the computing environments and tasks they will encounter as they enter graduate school or the work force. They should be exposed to the tools of their trade(s).

c. To increase productivity by providing students with up-to-date tools for bibliographic and database searches, and also for report preparation and graphics. They need to learn early how to manage the ever-increasing flow of information.

2. System Requirements

An "electronic studio" which satisfies the educational computing needs within the division of Natural Science must have the capability to perform the following functions: 1) numerical analysis, 2) statistical analysis, 3) color graphics, 4) data analysis, 5) simulation, and 6) word processing. These functions could be satisfied by the availability of work stations via an expanded Owlnet facility and by a widely distributed network of personal computers.

The emphasis of this report is on the availability of machines for both students and faculty, the standardization of software and hardware across the university and the availability of software consultants to assist faculty in integrating computation into the curriculum. These goals can be accomplished by the resources described in the following paragraphs:

A. We recommend that sixty Sun 4-60 (Sparc 1) workstations be added to Owlnet to accomodate the course-work needs of students in the Natural Sciences. This number of stations is based on an estimated l-l.5 hours per course per week use and a total Natural Science course enrollment of 3000-4000. Figured another way, this is 12 hours use per week by each of the 504 undergraduates in the division. We assume that each machine can be used -100 hours per week Owlnet currently has sixty workstations but sixty more are planned to satisfy the needs of the engineering division. The additional 60 machines needed for the School of Natural Sciences will be configured with 8 Mbytes of RAM and one 104 Mbyte swap disk We recommend that twelve of these machines be quipped with 19 inch color monitors and the Sun GX-1 graphics accelerator board. The remainder will be quipped with standard 19 inch monochrome monitors. Owlnet has approximately one server per ten workstations. Therefore, we expect that six Sun 4-330 servers, each configured with 32 Mbytes of RAM and two 892 Mbyte hard disks will be sufficient to serve the workstations. The availability of the machines can be assured by distributing them among the academic buildings which house the departments within the division.

B. We recommend that sixty personal computers, some Mac II's and some PC's be acquired.

To meet needs for group instruction, we propose a new computer classroom containing 20 of the sixty computers. This is necessary for planned simulation modelling activities in Biosciences laboratory courses. While homework can be done any time anywhere, efficient instruction in problem solving or simulation using a computer is often best accomplished in a group setting, much like traditional laboratories or tutorials; the computer classroom is designed to serve this need The classroom will also be available for reservation for any course on campus, and will he Operated as a public use facility when it is not in use as a classroom.

A second set of 15 computers will be reserved for instruction in computer-aided data acquisition and analysis, to be used in Physics, Biosciences, and possibly Chemistry laboratory courses. While it would be advantageous to have a dedicated computerized undergraduate teaching laboratory in each building, this is not feasible, so plans are to rotate the computers as needed.

The remaining computers (25) will be distributed throughout the same locations as the Owlnet workstations, and in addition, in the colleges and in Fondren. To work effectively, the computers should have small swap disks and be networked to a server with a larger disk for storage. Each computer cluster should be served by a laser printer. Therefore, approximately fifteen laser printers will be needed. Another useful piece of hardware is a classroom projection device for use in the instruction of students in the operation of the computer resources used for a course. One such system per department would provide this capability.

An important component of this proposal is the availability of machines for faculty as well as students. Therefore, funds should be allocated to each department for the sole purpose of providing faculty with personal computers for their offices. Our success in incorporating computers into the curriculum depends on providing the faculty with the necessary resources. Some faculty members in the division do not have access to a computer in their offices; many will not have access to the standard equipment This is a major impediment to implementation of this plan. We now have 111 full-time faculty, most of whom have computers. Hence 25 new ones should be sufficient.

Several new personnel will be required to maintain and support the system. Following the lead of Owlnet, two programmers for the Suns and one technician/lab manager for the MacII's and PC's should be sufficient for maintenance. We also believe that a new person should be hi to aid the faculty, when requested, in integrating computing into courses, as well as to provide instruction to the faculty in the use of the software. By facilitating the incorporation of computing into the curriculum the consultant would greatly reduce the inertia present in this task. The new personnel should probably be added to the staff of the Office of Computing Information Services.

The software currently available on the Owlnet would be appropriate for Natural Science course work as well. These packages include Matlab for numerical calculations, Maple, a symbolic mathematics package and S for statistical analysis. On the personal computers, we recommend Microsoft word for word processing and Microsoft Excel for spreadsheet applications. In addition, MathCad which is a mathematical equation solver which does not require programming would be valuable, as would PC-SAS for statistical analysis. Cricket will be used for graphics and Stella

for symbolic modelling. Though individual faculty members or departments may require specialized software, standardization should be encouraged.

Assuming 40-50 square feet of space per work station (see Engineering Plan), 120 units require a total of 6000 square feet. Of this, approximately 2000 square feet is required for a computer classroom-public use complex, which we propose be placed in the new BioSciences-BioEngineering buildings and the rest would be distributed in 6 smaller rooms (ca 500 square feet), one in each of the buildings housing Science Division departments. Machine-room space for the servers, as well as additional staff office space would require an additional 1000 square feet of space, possibly also in the Biosciences building.

3. Connectivity

The importance of connectivity cannot be overemphasized. The power and effectiveness of the system is greatly enhanced when all of the computer resources are networked. Then, students will be able to access course materials from the library, an academic building where the professor is located, or even from a common room in their college. Therefore, we recommend that the campus ethernet be extended to every academic building and college on campus. In addition, Ethernet should be brought to the office of every professor.

4. Coordination With Other Divisions

Joining Owlnet is a logical plan from both a performance and a cost perspective. The success Of Owlnet is a result of a great deal of time and effort. A large part of the startup costs can be avoided by joining this network. The engineering division would also benefit from the increased numbers of machines and their wide distribution.

Ideally, the personal computers would be networked to the workstations so that data could be transferred between them. For example, data generated on a workstation could be plotted on a Mac and incorporated into a typed report.

The reasons for dividing computer networks by academic division is somewhat unclear and has several undesirable aspects. Many of the uses for computers, such as word processing, cross divisional boundaries. Much of the software and hardware required by a division overlap that

required by other divisions. It is likely that a campus-wide network of personal computers which crossed divisional boundaries would offer cost advantages over several smaller systems, and an integrated system would be more convenient for students. Divisional boundaries are not very important to undergraduate students since they take courses in many of the divisions.

5. Impact of the Plan on the Curriculum

The educational computing plan for the Weiss School of Science will manifestly improve the quality and level of instruction throughout the sciences. By providing a common set of tools, we expect to foster an interdisciplinary synergism, wherein students will be encouraged to use tools developed in courses in one department to problems in courses taken in other departments. The consensus among faculty regarding the basic hardware and software tools is remarkably strong, and this promises to promote unity in a world where the explosion in information promotes fragmentation and specialization.

Implementation of this plan will help shift the content of the curriculum away from rote information transfer toward quantitative problem solving and question-asking. The enhancement of the power of students will radically alter the ability of the professor to communicate with the student and ability of the student to engage the material in a deeper and more sophisticated way.

Implementation of the plan will involve courseware development, especially in the life sciences, but will depend more heavily on acquisition and support of existing high-level Programming tools.