http://www.orat.ilstu.edu/emtbook/labfaq.html

DESIGN OF COMPUTER MUSIC LAB FACILITIES

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In the workshops we do, there are Frequently Asked Questions about setting up computer lab facilities for music programs schools, colleges, and universities. This is in response to those questions. We will make every attempt to keep this information up-to-date, but, given the nature of technology to change within a blink-of-an-eye, we can make no assurances especially in terms of specific technology items and costs. You may also find our textbook, *Experiencing Music Technology*, useful for more indepth discussions on many of the concepts noted below.We welcome any input you'd like to pass along to help this document grow and improve. Our e-mail addresses are at the top. Peter and Dave

I. Introduction

In planning for a computer facility for music, there are some overarching issues that one should keep in mind.

* Movement to decentralized computing with a client/server model

* The migration from mainframes to PCs to personal digital assistants

* Music and arts require special environments for computing

* Powerful potential of worldwide access to, and interaction with resources on the Internet

At an Apple Computer workshop several years ago, the following chart was presented. This dramatically illustrates the shift in the nature of computing and its application since the early days of the first "big iron "mainframes.

THE CHANGING TECHNOLOGY LANDSCAPE

	Mainframe	Personal	Intimate
Time	'60-'70	1980s	1990s
Where	Computer Room	Office	Anywhere
Scale	Floor	Desktop	Hand
Interaction	Type	See/Point	Ask/Tell
Applications	Custom	Generic	Components
Technology	Assembler/COBOL	Pascal/C	Objects
Data	Central	Personal	Collaborative
Performance	Response Time	MIPS	Accessibility
Communications	Circuits	Cables	Wireless

II. Possible Lab Models and their Characteristics

When setting out to design any computer lab, one needs to consider the objective for the computer space. There are four different models that you can explore when designing the space. Which model you pick affects how the space will be used and supervised. We will discuss the "multifunction" lab in more detail below.

Single User	Single Purpose	Multipurpose	Teaching
	i.e. Music Lab		
One workstation	Variety of Music Apps on a similar set of machines	Workstations for different applications	Workstation with Teaching Projector
Dedicated function	Dedicated to a set of functions within music	Multiple kinds of software	Dedicated to teaching
One person, long sessions	Individual/group activities	Group activities	Group activities
Restricted access	Open access within music	Open access/shared facility	Open access
Unmonitored	Monitored	Monitored	Monitored

III. Advantages for Multipurpose Labs

Some advantages of the multifunction lab over models:

* Ability to serve more people

* Encourages cooperative learning among students

* Space becomes a "center" for activity and special projects (benefits both for faculty/faculty interaction as well as student/student and faculty/student interaction)

* Centralized facility encourages shared resources, documentation, as well as people-support for training and help

* Technology seen as a resource for all, not the domain of a special techies or electronic-music types

* More easily managed

IV. Types of Workstations and Appropriate Components

In a multifunction computer lab, not all workstations are created equal. Each workstation or set of workstations should be dedicated to specific applications like music, graphics, multimedia, and administrative applications. Below we suggest the critical components for each of these types of workstation.

Music Workstation	Teaching Station
* MIDI keyboard * MIDI sound module * CD-ROM * 16-bit/44 mHz digital audio * Lots of fast disc storage	* Video projection and/or overhead * Color display * Amplifier and speakers
Multimedia and CAI Workstation	**Administrative Workstation**
*16- to 24-bit color * Digital and MIDI sound * CD-ROM (possibly videodisc or DVD) * Large amounts of RAM and hard disc storage * Amplifier, headphones, speakers	* Extended keyboard * Large screen * Printing and file sharing * Reasonably fast with lots of hard disc storage

V. Basic Specifications for Workstations

Computer	MIDI Workstation
* PowerPC (Mac) or Pentium II (Win) * 32+ RAM * 3 + gigabyte hard drive * 24X CD-ROM * Digital synthesis built-in * Super Floppy (e.g. zip)	* 5 octave * velocity-sensitive keyboard * Drum Kits * Effects generator * General MIDI * Digital synthesis sound engine
MIDI Interface Cords and connectors	Audio systems with speakers, amplifier, possible a small mixer

VI. Physical Layout

There are many things to consider in terms of the physical layout of your lab space. Here are some tips we will pass along:

1. Number of workstations: assuming a lab open 80 hours per week, figure on one (1) workstation for 10 "active" users.

2. Consider a multipurpose room that has space in the center for class gatherings with workstations placed along the outside perimeter. Room can also serve as a multimedia lecture room if a screen and sound system is installed (Teaching model). (Rooms with space in middle also have the psychological advantage of feeling more open and warmer-important for tech labs.) Consider using one of the workstations as the "teaching station" in those instances when the room might be used for teaching.

3. Other configurations include: (a) back to back tables, (b) rows of tables, (c) islands. Note: each of these three arrangements need special consideration for electric outlets. Rows of tables that all face one direction offer special convenience if you want all students to work from computers as you are demonstrating.

4. Remember to save room for a monitor's desk, file cabinets, storage, server/tape backup equipment, and printers. Printers need access space.

5. Furniture/Chairs: Many options. Recommend units that have removable shelving with open backs for easy access. Special need is the efficient use of space for a music keyboard as well as typewriter keyboard. Suggest moveable (wheels) units for flexibility.

6. Chairs ought to have good back support and be on wheels.

7. Electrical and Lighting. Plan on a least one 6-outlet powerstrip for every workstation. Lower level lighting is ideal. Consider surge protection. Ensure adequate and stable power.

VII. Software Issues

Software Tips

* Maintain a variety of software, but watch that certain software categories do not dominate; For instance, music printing and sequencing can easily monopolize a workstation for hours. Match the function of the lab with the kind of software installed and used.

* Approach software budget as a music/arts unit issue, not just lab. Seek software solutions in a much wider arena.

* Determine from general campus computing center if certain site licenses exist for titles already or if budgets from central administration can support site license purchase.

* Secure your master diskettes

* Register and keep software organized

Budget

* 25% of hardware investment

* Plan for updates (can be a large percentage of continuing budget)

* Decide on multiple vs single copies

* Seek peer consensus

Distribution Schemes

* Purchase single copies for each workstation (expensive, but sometimes only way)

* Single server copy (not recommended because of load on network)

* Purchase site licenses (often not available for limited-market music software)

* Use the "key server" strategy: Buy the number of copies that you feel will be used simultaneously. Install copies of everything on all machines, but link machines to Server that monitors the launching of each software titles. This approach has advantage of working throughout the Music/arts unit if all machines are networked. This use of network can save money in the long run. Note: Key server strategy still not tested in courts.

Copyright

* Some purchase agreements allow one archival copy only, others allow individual owner to install on each individually owned machine.

* In practice, try to educate your users about the law. Encourage enforcement. Plan for core applications that are supported in multiple copies.

VIII. Planning and Budget

The following budgets are based on estimated costs for hardware and software. Obviously, prices vary according to the supplier and our attempt here is to offer working models that bear some relationship to reality. Competitive bidding and support are important concepts to keep in mind as you choose a vendor for your purchases.

Here are some assumptions:

* We assume secure rooms with adequate space and electrical outlets positioned in desired locations.

* Personnel costs or estimates for repair during the year are not included.

* In terms of networking, we include the most basic network with Ethernet connections between each computer. Connectivity to the Internet can often be negotiated with the school or campus networking support and administration.

* Either a Macintosh or a Windows/PC environment will work with the budget estimates. A mixed software environment is also possible, especially with many software applications available on both Wintel and Mac OS platforms (e.g. Clarisworks, Finale, Encore, Master Tracks Pro, Eudora, Netscape, Powerpoint, etc.)

The first budget (Column 1) assumes a setting for a single user workstation. Perhaps this station would be used for teaching/demonstration or for use by students on a rotating basis. Modest equipment for sound production is assumed and a black and white projection system is included.

The second budget (Column 2) might be appropriate for simply adding music resources to an established general purpose lab (a multifunction lab) that is shared by others in the school or on the campus. Here we are just adding components and software so that 10 workstations would be suitable for music activities.

The third budget (Column 3) might be model for a music lab controlled and operated by music department. Here we are building the lab from scratch to provide 10 workstations for dedicated music activities.

Item	I No.	Unit cost	Total	II No.	Unit cost	Total	III No.	Unit cost	Total
CPU's/Drives PowerPC/ Pentium II w/ Basic Color Monitor, CD ROM/standard keyboard	1	2,380	2,380				9	2,380	21,420
PowerPC/Pentium II Teaching Station w/ Basic Color Monitor CD ROM/standard Keyboard							1	2,680	2,680
Printers/Scanner Ink Jet Color Printer	1	400	400				1	400	400
Laser Printer							1	1,500	1,500
Color Scanner							1	300	300
Digital Camera							1	600	600
Projection Overhead projector/screen, Low-level Projector	1	2,000	2,000						
High-level Projector				1	4,200	4,200	1	4,200	4,200

Music MIDI interfaces	1	40	40	10	40	400	10	40	400
Low-end MIDI Keyboard	1	450	450						
Midrange MIDI Keyboard				10	800	8,000	10	800	8000
Mixers/headphones				10	200	2000	10	200	2000
Software			1,730			4,400			8,900
TOTALS			**7,000**			**19,000**			**50,000**