ASSESSMENT OF NEEDS AND PRIORITIES

1. Overview of Current Technology / Equipment Districtwide and by Campus

The Instructional Media Center (IMC) provided classroom support with projectors, sound and video playback, public address systems, production of audiovisual materials for instruction, a learning resources center, and technical support for campus events. Until recently, **audiovisual** was the principal communication technology for instruction in the Riverside Community College District.

Television is used in classroom instruction. The campus has a satellite downlink and an interactive television system that works on digital telephone lines.

Distance learning distributes tape-recorded television lessons via local cable and wireless-cable. The broadcast lessons are complemented by 15 hours of on-campus instruction. Over 1,000 students enroll each semester in approximately 22 courses..

Computer laboratories have been developed to support interactive learning in applied technology, art, engineering, English, computer and information technologies, music, science, social science, and writing. Computers are becoming integral to teaching and learning in almost every area of the curriculum. The marriage of computers with telecommunications has created networks. The Internet, a global network of networks, has caused the computer to take center stage as an emerging educational technology.

1.1 Current Technology and Equipment

This section will deal with technologies under the organizational units that manage them and/or are proposed to manage them in the future.

Instructional Media Center (IMC)

The IMC is responsible for the following functions:

1) Acquire, manage, operate and maintain equipment and systems installed in classrooms and smart-classrooms
2) Check-out equipment and materials for classroom use – projectors, audio/video playback, public address systems, video equipment
3) Record events on videocassette; produce video lessons in collaboration with faculty
4) Produce media – design, produce and duplicate graphics, slides, overheads, videos, and multimedia
5) Schedule, downlink and connect satellite lessons to classrooms and conference rooms; setup and operate two-way interactive video between campuses and with external organizations

Broadcast television translates the classroom paradigm of group teaching into multiple classrooms, industries, and homes. Live television classes are a *synchronous* method of teaching and learning that link people together according to a fixed schedule. The focus is on teaching and the teacher. It has the advantage of low cost distribution and is accessible on broadcast or cable television. The "drop in" audience may be much larger than those enrolled for degree or certificate credit and should be considered as a community service and a promotional device for college programs.

Individualized learning is usually asynchronous. It can occur anywhere and at any time. It accommodates different learner preferences, schedules, and pace of learning. It can be interrupted and resumed at will. It opens educational opportunities for persons who travel, have families, or otherwise cannot participate according to a predetermined schedule.

Videotapes can be used for asynchronous learning, but the new knowledge media – computers and telecommunications – are powerful instruments for interactive learning. It is notable that ten of eleven distance learning institutions with enrollments over 100,000 focus on individual learning, not on group teaching (the exception is the Chinese Television University system).

Telecourses ands Teleconferencing at RCC

RCCD receives satellite teleconferences and courses on tape and distributes television lessons by supplying videocassettes to local cable companies. At this time RCCD cannot originate live broadcast or satellite programs. The RCC campus is a head-end for Cross County (Wireless) Cable. Moreno Valley is negotiating a head-end for TCI Cable. In the future, it will be possible to originate live and recorded programs via local cable from each campus.

RCCD has interactive video (teleconferencing) equipment on each campus. Interactive video requires ISDN telephone lines and a multi-point connection where more than two sites are to be connected. Picture quality is improved when multiple ISDN lines are used. Each campus has purchased three ISDN lines (384K) under the Education First program from Pac Bell. An internal multi-point bridge can connect up to four sites using a single ISDN line (128K). External bridging can be rented for connection at higher data rates. All participating campuses must use the same data rate. *RCCD equipment was recently upgraded to meet the current standard for the community college system and the California State University.*

Interactive video connections for RCCD campuses can be accessed from one of the following classrooms on each campus:

Riverside City Campus (patched by RCC IMC):

AD 122 (Board Room), Administrative Conference Room, BE 10, LB 102, LS 108, Quad 134, Quad 144, (Hall of Fame is yet to be installed).
Moreno Valley Campus (Patched by IMC Office in Hum 220): Hum 120, Hum 129, Hum 209

Norco Campus (patched locally): ATec 114, Hum 111, Student Services 101, (Little Theatre is yet to be installed)

Computing this statistic separately for each campus gives a different picture. The computer to FTES ratio at Moreno Valley and Norco is of the order of 1:11 while on the City Campus it is about 1:50.

If labs are open for an average of 60 hours/week, that equates to an average of 14 minutes per course per week for students on the City Campus and one hour and ten minutes per course per week at Moreno Valley and Norco.

1.2. Anticipated or Already Scheduled Additions

Instructional Media Center. The greatest immediate change in IMC function is installation of new television monitors and digital video projectors in classrooms, and possible addition of computers or computer connections to some of these devices to make *smart classrooms*. To provide flexibility, digital video projectors will also be available on carts for checkout or supplied with an operator. This will be standard on all three campuses, although the level of video and computer support is much higher at Moreno Valley and Norco.

Part of the IMC space on the City Campus will be the site of the proposed Faculty computer training and production lab described later in this section. Equivalent spaces will be identified at Moreno Valley and Norco. At Moreno Valley the IMC will house the head end for cable television. Similar spaces will be identified for cable head-ends at City Campus and Norco. It is expected that graphic and video production capabilities of the IMCs will increasingly be used to support development of World Wide Web pages for campus instruction.

One-time capital funds have been released for instructional technology needs. About 90% will be used for computer related purchases and 10% for television related equipment and classrooms.

Faculty computer training and production lab. Instructor training is a prerequisite to effective use of the new student computer labs. All three campuses will promote use of student and faculty labs starting with computer literacy and basic skills with word processing, spreadsheets, and databases.

Specifically, the Faculty computer training and production lab will train faculty to:

- Use computers, computer applications, networks and the Internet.
- Design, produce, implement and evaluate computer developed printed materials, instructional presentations, and interactive teaching and learning media.
- Acquire or develop, implement and evaluate lessons segments, lessons and courses that involve text and graphics, presentation graphics, color overhead projectuals, desktop publishing, 3-dimensional graphics, digital audio and video, animations, interactive multimedia, CD-ROMs, Web pages
- Teach advanced workshops and assist individual faculty to design, produce, implement and evaluate lessons and courses.
- Test, demonstrate, implement and evaluate new and emerging learning technologies

4. A strong research base. When thousands of students use the material for each course and millions of people view each TV program, the content must be academically up-to-date and presented clearly. Thanks to economies of scale, the Open University has resources to move the academic paradigms steadily forward.

RCCDs approach to distance learning will increase courses taught live on television and strengthen interaction and support by telephone, email, chat room and forums on the Internet.

RCCD will initiate distance learning that can be shared on a statewide basis. The CCC will shortly fund a pilot project for Statewide Delivery of Distance Education that is designed to select, purchase or site-license, revise and/or produce distance education courses for statewide delivery.

Television courses. Developments already underway include courses taught K-College and telecourses available on local broadcast and cable channels. It is important to note that RCCD assigns instructors to distance learning students, but not with the level of mentoring offered by the British Open University.

Computer and Internet Courses. As computer and telecommunications infrastructure is installed, RCCD will make courses available on the World Wide Web. This will be a large enterprise in the future are requires a comprehensive plan, staff, production areas, and production oriented hardware, software and authoring programs. It is projected that secondary effects after construction of the new library will convert the second floor of the existing library building for distance learning classrooms, teleconferencing, and production of World Wide Web pages for instruction.

Computer Labs and Networks

For the foreseeable future, the major focus of activity will be installation of computer labs and development of computer based courses. It is important that every graduate of RCCD be computer literate and skilled in the use of the Internet to maximize his or her job opportunities. This will be an expensive venture. However, it can be successfully accomplished through careful planning, good teamwork and community / industry collaboration.

How many computers are needed?

There are several ways to determine the required number of computers. One is to total the number of computer laboratory hours needed to support each course. This method is subject to error because many more classes will use computers when they are available.

Another approach is benchmark against similar organizations that use computers to offer comparable courses and programs. This produced some interesting statistics shown in Table 2.

For planning purposes, a goal is 1:4 as proposed for the RCCD, the ratio proposed for the State of California K-12. This would require 4,150 computers compared to the present inventory of 740, a difference of 3,410 computers. The majority of these are needed on the City Campus because of its higher FTES.

First Steps

In 1997, RCCD is upgrading infrastructure for computer labs and networks as follows:

1) Token ring networks at Norco and Moreno Valley instructional labs and library were replaced by Ethernet in as part of Secondary Effects – *completed.*

2) A large (120 station) General-Purpose lab was setup at Norco (Secondary effects) – *completed*

3) A large (120 station) General-Purpose lab was setup at Moreno Valley (Secondary effects) – *near complete*

4) District standards were setup for computers, networks, servers, and printers. Pentium II computers using Windows 95 or Windows NT will be purchased until replaced by a newer technology – *completed*

5) District Standards were setup for networks. 3Com switched networks with ATM backbone were selected – *installation in process*

6) A bid was initiated in Summer 1997 to purchase computers and related equipment – *completed.*

7) A *band aid* action added 30 state-of-the-art computers on City Campus at the beginning of the Fall Semester so that Office 97 could be taught on all three campuses. An additional 30 computers were added in October – *completed.*

8) Departments on City Campus and the Senate Technology and Equity Committee are meeting with the Dean of Learning Technologies to establish needs that can be satisfied within this year's budget and initial priorities for next year's budget – *ongoing.*

9) Grant applications were generated for multimedia, distance learning, and faculty computers– *completed.*

How much will it cost? And how long will it take to reach the desired level of computers and support?

At a purchase price of $3,000 each, computers alone represent a cost of $10.3 million. Networks, printers, servers, and software will double this cost. In some instances new construction, renovation, or rewiring will be needed. Consider also the cost of technicians and lab aides.

For planning purposes, a five-year goal fits with the life expectancy of computers. If the desired inventory can be achieved in five years, continued purchase at that level year-by-year will maintain the inventory of current computers. Networks and servers have a longer life expectancy.

The bottom line is that approximately $25 is needed to achieve the 1:4 ratio. If this is a five-year goal, it will cost $5 million each year. Starting in year six, 20% of the inventory will need to be replaced. In other words, there will be a continuing cost of $5 million each year.

INCREASING UTILIZATION OF COMPUTER LABS AND INFRASTRUCTURE

INEFFICIENT USE OF FACILITIES	SUGGESTED ALTERNATIVE
Instructor led classes that are primarily lecture and demonstration.	**Teach in smart classroom**, then assign students to work in open computer lab where assistance is available.
Scheduled labs – e.g. 3 hours morning, three hours afternoon, three hours evening, 4 or 5 days.	**Create multipurpose labs operating 16-24 hours daily**. Instructors and/or lab assistants should be available as required.
Dedicated laboratory for one discipline. (Partially filled laboratories result in further loss of efficiency.)	**Create multipurpose labs**. If open labs are not suitable, combine labs for related programs wherever possible.
Labs closed because funds are not available for supervision.	**Consolidate small laboratories into larger units and combine support staff.** This will increase equipment utilization and maintain or reduce supervision cost.
Unsupervised laboratories.	**Add television surveillance** to all labs for added security. Supervised labs may be unsupervised for short periods. **Note:** Assistance should always be available to students when needed.
Requirement for all computer activity to be conducted in the assigned laboratory.	**Use open labs and remote access to expand lab capacity**. If students can use computers at home or in the workplace, this reduces space, equipment and maintenance requirements on campus. Connection via the internet and / or cable TV are less expensive than providing lab facilities on campus. Note: **Distance Learning** should be explored for expanding class capacity, reaching unserved students, and providing anywhere-anytime learning and just-in-time learning.
Overcrowded labs with inadequate air conditioning.	Personal comfort adds to lab efficiency for instructors and students. Also, overheated equipment is much more prone to failure.

Consolidating laboratories and extending lab hours enable fuller utilization of facilities, equipment, software, and networking. Added cost for personnel and maintenance is trivial compared to savings from higher utilization of facilities, equipment, network infrastructure, and software.

Amortizing Equipment Cost. Consider the following hypothetical examples. The installed cost of each computer, including servers and networks, is $6,000. A lab is kept open for 30 hours per week for 50 weeks and the life of the equipment is four years, the amortized cost of equipment is $1 per computer per hour if the lab is utilized 100%. If the lab is open 90 hours per week and utilization is 67%, cost averages 50c per hour.

If the lab is open 120 hours a week and utilization averages 50%, the cost is 50c per hour. There may come a point of decreasing returns. For example, in a 140 station lab open 30, 60, 90, and 120 hours the total hours of student use is 4,200,

Data Security

Administrative and instructional computers are connected to the network as separate Virtual Local Area Networks (VLANs). The VLAN allows the physical sharing of the network infrastructure yet provides absolute protection against students accessing administrative data or the administrative VLAN.

Networks and Operating Systems

10Mbps Switched Ethernet is the standard selected for workstations on the RCCD Instructional Network. The backbone connecting computer labs, faculty offices, and classrooms will use ATM, 100Mbps Ethernet, or 10 Mbps Ethernet depending on data requirements and location with respect to the backbone. All computer stations are wired with Category 5 wire to support data rates up to 100 Mbps. The campus backbone is fiber optic cables with multiple pairs of fiber including unused (dark) fibers for future system expansion.

Student labs constructed or refurbished in the second half of 1997 have switched Ethernet. All student labs will eventually have switched Ethernet to permit network intensive activities involving graphics, sound, video, multimedia, and transfer of files and overlays.

New and upgraded student labs are concurrently installing 300 Mhz Pentium II computers, Compaq Proliant file servers, and Hewlett Packard 5SiMX printers. Software includes the Windows 95 operating system, Office 97, and either Novelle Netware or NT Workstation for the network operating system. Manufacturers, model and versions will be periodically changed and updated to ensure a high quality learning environment.

Older labs on the City Campus will be upgraded, as budget is available. Student stations in some labs installed prior to 1997 have no hard disks and run from the file server. Some computers still use the DOS operating system and Windows 3.11 as the user interface. Instructional labs that are not refurbished with new equipment will be upgraded to PCs with hard disks and extended RAM memory.

Computer Communications and The Internet

Computers communicate with other computer via Local Area Networks (LANs). LANs communicate with other networks across a wide area via Wide Area Networks (WANs). WANs connect LANs through telephone lines, fiber, cable, microwave or satellite based on availability and cost. The Internet is a global network of networks.

Routing of Internet data is transparent to the user. Multiple telephone and telecommunication companies are dynamically linked wire, cable, fiber, microwave and satellite to make a connection. Telecommunication company computers select the preferred path, and for practical reasons this anonymous linkage is called a "cloud." Control is shared dynamically between multiple telephone companies and Internet Service Providers (ISPs) so that no single organization controls the flow of information.

District Net

Connection between campuses within the District requires T1 lines for the administrative network, the instructional network, 4CNet and the Internet. To have sufficient capacity will require the purchase of several T1 lines for each campus. Assuming four T1 lines per campus, this would cost of the order of $120,000 per year. Expansion for better Internet service could double this amount by the year 2,000 and continue to expand.

Several alternatives were explored.

1) leasing dark fiber. This would require connection through multiple vendors that would include telephone companies from whom we procure these services at a highly discounted rate. No significant benefit could be expected from this approach.
2) Many cable companies are installing fiber to provide broadband services. The possibility of partnerships where RCCD and other educational providers provide programming in return for district fiber and Internet connections should be explored.
3) Bury RCCD fiber between campuses. This is impractical because of legal (right of way) problems and high construction cost.
4) Use ITFS frequencies. Unfortunately RCCD does not have any ITFS and no more frequencies will be available in this area. Pac Bell (the new owner of Cross Country Cable) has secured available bandwidth on the University of California Riverside ITFS frequencies.
5) Connect via microwave. Northern Arizona University (NAU) uses this for its statewide network. The system links multiple two-way television programs, campus telephone, and Internet between sixteen campuses. Microwave requires line-of-sight connections between transmitters and receivers. One mountain site new Flagstaff AZ can see all Northern Arizona campuses. The system was constructed primarily with grant money is very cost affordable.

Options 2) and 5) should be explored in depth. Option 2) is the preferred option if a suitable partnership can be developed. Option 5) is a fall-back option that would require a million dollar investment to be amortized over 20 years.

Consultant Study

A preliminary consultant study showed that direct connection between the three RCCD campuses is not possible due to geographic barriers. City Campus and Moreno Valley have a clear view of microwave towers on Box Spring Mountain; another mountain site such as Jurapa Mountain or Radio Hill may be required to connect the Norco campus. A more comprehensive study is needed to determine actual costs and the most cost-effective option.

For the cost of T1-level services for the next four years, RCCD can construct a microwave link with extended capacity for future growth. An operational fully redundant DS3 (56 Mbps) link between all three campuses would cost of the order of $600.000. This would have the capacity of 28 T1-lines connecting each campus. ATM would triple this capacity for an additional $400,000. (A non-

Technical problems should be anticipated when new software is installed for the first time. New versions of software may not work on older computers, or may be costly in technician time to configure. Some new software may require more memory and faster processors. They may overwrite older versions, destroy programs and configuration, disable other applications, and overwrite drivers, programs and registry. Removal of programs to free-up hard disk space may also be problematic. These unknowns escalate operating costs for personnel, software, and ultimately – hardware.

A set of policies and procedures is required to coordinate, test, load and remove software. Technicians should perform this task to identify problems and incompatibility. New software for reloading computers is being investigated so that problems that affect a large number of computers can be quickly rectified.