Curriculum Guide
for Computer Recycling and Repair Employment Training
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1. What Can You Learn From Computer Recycling?

City agencies, potential employers and donors frequently ask this question. The answer depends on the philosophy and goal of the computer recycling and repair training program. Training programs have to decide whether their main business is job training or refurbishing and recycling computers.

Community-Based Organizations (CBOs) which currently provide training for disadvantaged individuals may focus on computer recycling as a basis for teaching and casework. Other computer recycling organizations may include training programs as a secondary activity to their regular business. Any program that includes a training component in its recycling program must be able to define the skills that individuals will be taught and quantify the outcome of the training program.

The *Guide for Computer Recycling and Repair Employment Training*, with the assistance of CBOs, educators and the business community, develops a computer recycling and repair curriculum standard. A standardized curriculum will provide repair students with a basic set of recognized skills and will also assist them in efforts to pursue permanent employment or qualify for advanced training.

By working together to develop curriculum guidelines, Bay Area computer recycling and repair training programs will also improve the credibility of their respective programs and more effectively articulate the universal benefits of hands-on training and computer reuse in low-income communities. This guide is intended to assist Community-Based Organizations which currently offer computer repair and recycling training programs, as well as CBOs which have interest in starting a computer repair or recycling program.

Developing computer repair recycling and training programs in low-income communities is a challenge. A dialogue among community-based recycling and repair programs is sorely needed. Such a dialogue would support the non-profit computer recycling activities throughout the Bay Area by identifying the resources necessary to operate a program and would determine how to best assess client skills, define client support services and develop job placement programs that will serve the best interest of the communities that are being served.

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2. Organizational Resources

The organizational needs listed are for informal training programs as well as certification programs developed by the industry (such as the A+ Certification program by the Computer Technology Industry Association (CompTIA) and the computer repair technician program by the Regional Occupational Program (ROP).

The following recommendations for space, equipment, visual aids, repair tools, text books and instructors are based on the suggestions of several community-based computer recyclers and represent the minimum requirements. Space and equipment needs will depend on whether the CBO focuses on training or recycling and production.

2.1 Space and Equipment

Space

When the training program focus on hands-on training the classroom training and teaching becomes secondary. For this reason a separate classroom will not be absolutely necessary. Classroom and library space should be integrated into the lab area The facility should also have space for other needed ammenities (meeting areas, kitchen, bathrooms). **150 - 200 square feet space per person** is advised for lab facilities.

However, if the CBO is dedicated to teaching and the recycling and refurbishing of computers is secondary, the program needs a designated teaching area which is not a part of the warehouse operations.

The amount of warehouse space needed by a CBO recycling program depends on the total amount of material handled by the recycler. A **minimum of 40,000 sq. ft.** of space is required by most recycling organizations to handle teaching as well as operational needs.

Visual Aids

A blackboard, a projector, a computer with all accessories for demonstrations and a computer with internet access should be included in the classroom/lab area.

Physical examples of computer components should be displayed on a board or table to clearly show the function of each item.

Equipment

Each student should be given:
*   his/her own set of correct-size screwdrivers for all screw sizes and power screw drivers.

Each student also needs:
*   work desk with shelves for monitor and keyboards (for analysis and repair)
*   shelves/containers for screws
*   lamp for each workstation

A variety of small hand tools and other tools (for instance, dental mirrors for viewing small areas on motherboards), etc. should be available in a central location for all students.

Equipment needed for the warehouse:
*   rack systems
*   hand truck
*   palettes, palette jacks, compressed air
*   folklift
*   truck (either leased or owned)

All equipment should be in close reach of the students

and able to be rolled, if possible.

2.2 Textbooks

The A+Certificate Training Programs recommends:

A+Core Module Study Guide
ISBN 0-7821-2181-0
A+Windows/DOS Study Guide
ISBN 0-7821-2182-9
Macintosh Study Guide
A+ Certification Theory & Study Guide

All by author David Groth, Published by SYBEX

The ROP-Training Program recommends:

Upgrading and Maintenance
Published by SYBEX

In addition, the following alternative textbooks are helpful for a training program:

Upgrading and Repairing PC's
By Scott Mueller, Published by QUE
Hard Drive Bible
Published by Corporate Systems Center
Guides & Learning Series
magazine - Published by PC Novice
www.smartcomputing.com
as well as other magazines and articles.

These books could be included in a library; each student should also have their own textbook with copies of articles and class notes.

2.3 Instructors

Need:
*   ability to instruct students at the lab
*   ability to lecture and give classroom lessons,
*   motivation, organization and technical knowledge

2.4 Funding Sources

Average cost of a training program: $ 50,000 per year

this section is incomplete
   - Private Foundations:

   - Public:

- Education:

- Corporate Sector:

2.5 Organizational Needs

The training program is based on the hands-on experience of the students. However, a training program should also fulfill the following organizational needs to develop an effective computer repair & recycling operation:

- Procedures for materials flow — intake and exit of computers
- Marketers/Solicitors of used computers
- Recipients for donations or resale
- Recycling / facilities for recycling or scrapping
- Documentation of inventory and warehouse management
- Transportation
- Staff labor
- Administrative costs

* In order to focus on a training program, the operation supervisor and the training instructor should be two separate positions.

3. Client Skills and Assessment

For formal training programs communication and math skills of at least 10th grade are recommended. For informal training programs students should have a minimum of 5th grade entry skills to perform many of the repair functions. For understanding and performing all repair functions clients will need 9th grade levels.

3.1 Remedial Education

Low-income and disadvantaged individuals often need remedial education. Many participants in CBO training programs have reading, math and language skills of 8th grade or below. For example, participants at the East Bay Conservation Corps enter the programs with as low as 2nd grade levels and up to 12th grade levels. The majority of the clients are between 5th and 8th grade levels. **Clients on average gain 2 grade levels for every fifty hours of education.**

The computer recycling and repair training programs

which want to provide remedial education and GED training can call on the experience of organizations providing GED Preparation Programs. Assessment centers or tests can be used to find out if the student needs help with specific subjects. Evaluation and periodic dialogue with the student about the development of students skill levels (remedial skills, training skills, life skills) is advised during the term of the training. An individual work and training plan should be prepared for each student.

Besides the remedial entry skills students should demonstrate some of the following skills in order to participate successfully in the training program:

Thinking skills	creative thinking, problem solving, abstract thinking, knowing how to learn
General workplace competencies	using tools and equipment
Interpersonal skills	teamwork, helping others to learn
Information	organizing and maintaining information
Technology, equipment and applications	understanding use of proper tools, maintenance and troubleshooting
Physical capabilities	manual ability to use both hands

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3.2 Work Experience

Another important factor in training is work experience. Young clients often do not have the advantage of work experience, as do older, homeless or disabled clients. Hands-on experience is necessary for entry into the job market.

Hands-on time (work experience) in the employment training program helps increase the chances of employment for all clients. The computer recycling and repair training experience of at least 10 weeks at local CBOs is helpful for youth without work experience. Additional classes that encourage students to fill their knowledge gap should be provided as motivation for students to enhance their understanding of the computer industry.

3.3 Casework Support

Intensive casework should be included in the training program in order to support clients' efforts to prepare for extended education programs or to enter into the job market. Homeless, formerly incarcerated and chemically dependent clients have a more difficult time entering the job market. Although social service and training providers are able to identify employment opportunities, they are only able to place about 30 % of the above-mentioned clients into the job market.

Mentor-type casework can improve the student's life skills as can workshops and counseling. Mentor relationships can provide motivation for learning, working and improve the student's chance of independently placing themselves in the job market.

Nonprofit computer recyclers or CBOs which do not provide casework and job placement as part of the training program could cooperate with the Private Industry Council's one-stop career centers. The one-stop career centers provide casework, counseling, remedial education (GED) and soft skills training. They also offer partnerships with local CBOs without extra costs.

4. Training Curriculum

- **Life Skills:** Communication skills, resumes, etc.
- **Repair Skills:** Replacement and installation of disk drives, hard drives, motherboards, controller cards, assembly of computers
- **Software Programs:** DOS 6.22, Windows '95, Windows 3.11, Excel 5.0,Word 6.0
- **Recycling Knowledge:** the recycling of computer

contents, hazardous materials management, safety and emergency response, introduction to the basics of a recycling businesses

There should be an orientation for all students at the beginning of the training. Clients enter with a variety of social and technical skills. The clients will need an orientation period in order to become familiar with a new environment, reduce the stress of doing something new and to build relations with other students. The clients should participate in less demanding recycling activities for approximately two weeks in order to become familiar with the industry. Instructors and caseworkers should counsel and assist the students during this time in order to determine if computer recycling and repair is a suitable employment opportunity for the student.

The orientation period will also allow students to decide for themselves whether to continue in the computer recycling and repair training program. If the students choose to continue the training program, they should be more motivated to work hard and finish the program.

4.1 Social Skills, Life Skills and Support Systems Training

The training programs should also focus on the following life skills development in their curriculum:
- developing communication and rhetorical skills
- increasing teamwork and team building
- learning how to make customer contacts
- learning to write a resume
- learning how to apply for a job (by phone or in person)
- learning how to present oneself to an employer

Life skill development can be incorporated into the curriculum through one-on-one interviews, group sessions, counseling, role playing, mock interviews, etc.

4.2 Computer Recycling & Repair Employment Training

The ROP-Curriculum suggests a training program term of 120 hours, combining theoretical teaching and practical lab work, as well as an additional hands on training of another 120 hours. ROP also suggests the following teaching methodologies: discussions, demonstrations, conferences, work groups and field trips.

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Sample Training Plan

Student's Name	Entry Skills	Goals after 2 months	Goals after 6 months	Goals after training
Work History				
Assessment Center/test				
Remedial Skills math reading writing listening speaking	8th grade 6th grade 6th grade 8th grade 8th grade	enroll to take the GRE readiness course	Prepared to pass the GRE test	pass the GED, reach 10th grade levels
Computer Recycling and Repair Training	no special computer knowledge	complete curriculum, adequate knowledge	pass the test at the training program	pass the A+ certification test
other skills creative thinking abstract thinking problem solving team work use of tools maintenance	good skills minimum minimum minimum excellent good skills	additional class casework, support casework		
Special interests, opportunities	driving and repair of vehicle	use the manual capabilites for computer repair	special driver's license	

The CompTIA A+ Certification Curriculum suggests two training parts, the core and the Microsoft DOS/Windows module portion, each of about 270 hours. Students can pass the A+Certification test after completing a self study or participating in a training program at an A+Authorized training provider. The programs should be a mixture of lectures, discussion and practical demonstrations.

The timetable suggested for a 240 hour training program is three hours of lecture and five hours of practical work on Monday, Wednesday and Friday and eight hours of practical work on Tuesday and Thursday.

4.3 Curriculum Contents of the ROP Computer Repair Program

- **Structure of a Computer and Components:** functions and contents of the components, handling hazardous materials, safety and protection at work, environmental regulations
- **Avoiding upgrading pitfalls:** backing up data, upgrading drives quickly and efficiently, plug and play, upgrading Flash BIOS for plug and play, troubleshooting device drivers in Window 3.1 and Windows 95)
- **Using Microsoft diagnostics to learn about computers:** Microsoft Diagnostics (MSD), using MSD to find upgrade and configuration information, alternatives to MSD, decoding error messages
- **Precautions before beginning:** creating system diskettes, backing up system files in MS-DOS or Windows, restoring backup data, understanding backup options and setup file strategies, developing backup schedules, creating bootable diskettes
- **Installing Random Access Memory:** evaluation of current amount of RAM, understanding upgrade options with RAM, identifying different RAM and RAM-board types, locating SIMM sockets on the motherboard, removing and replacing RAM
- **Installing CPUs:** removing CPUs, fans and heat sinks, understanding ZIF and LIF sockets, substituting new heat sinks, replacing old CPUs, adding overdrive CPUs, updating software for new CPUs
- **Installing Hard Drives:** choosing new hard drives, installing hard drives, partitioning and formatting drives, installing second hard drives, understanding options for data storage
- **Installing Diskette Drives and Tape Drives:** replacing diskette drives, removal and installation of diskette drives, understanding the function of diskette drives, installing tape drives, troubleshooting diskette drives and hard drive problems

- **Installing Multimedia:** multimedia upgrading, understanding multimedia standards, installing sound cards, installing CD-ROM drives
- **Installing Video Cards and Video RAM:** upgrading video capabilities, installing graphic cards, upgrading video RAM, identifying and solving monitor problems
- **Installing External and Internal Modems:** understanding how modems work, installing external and internal modems, using modems with phone lines, effective use of modems
- **Installing Keyboards and Joysticks:** understanding input devices, choosing and installing a keyboard, installing joysticks and game cards, exploring the types of input devices, including infrared and voice recognition, maintaining trouble-free input devices
- **Installing Printers:** understanding the function of printers, installing laser and inkjet printers, troubleshooting printer problems
- **Installing Scanners:** evaluating different types of scanners, understanding optical character recognition (OCR), installing scanners
- **Installing Serial and Parallel Ports:** assessing the need for additional ports, assigning addresses to ports, putting ports in optimal use, installing I/O cards
- **Installing Motherboards:** understanding what can be upgraded, considering the pros and cons of an upgrade, installing motherboards, testing and troubleshooting motherboards
- **Installing Power Supplies:** upgrading power supplies, understanding the function of power supplies, evaluating power supply needs, installing power supplies
- **Upgrading Portable Computers:** understanding the work of PC cards, using the different types of PC cards, upgrading portable processors, RAM and hard drives, cost effective upgrading
- **Setting up an Ethernet Network:** nuts and bolts of networks, hardware and software choices, avoiding common network problems, installing Ethernet networks, getting the most from the network
- **Building a PC:** considering the benefits of building a PC, evaluating the needs and selecting components, assembling the computer, testing the results, installing the mouse, modem, CD-ROM drive
- **Increasing Space on Hard Drives:** increasing a hard drive's capacity, compressing drives under DOS and Windows 95, using file compression utilities, avoiding time consuming compression

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mistakes
- **Using Memory Managers:** understanding the work of memory, evaluating the potential for improving performance, comparing memory management utilities
- **Upgrading Operating Systems:** installing newer DOS versions, upgrading from DOS to Windows or OS/2 Warp, upgrading from Windows 3.1 to Windows 95 or OS/2 Warp, running two operating systems
- **Adding on to Web Browsers:** understanding Web browser add-ons, installing add-ons, getting the most from multimedia, using utility add-ons
- **Troubleshooting Tips and Tricks:** understanding troubleshooting basics, checking computer configurations, opening computers for repair, troubleshooting diskette drives

4.4 Curriculum Contents of the CompTIA A+Certification Program

Module I   A+ Core Module
Module II   A+ Windows/DOS
Module III   A+ Macintosh

Current Curriculum for Module I:
- **Introduction to the Personal Computer:** introduction to basic typing, introduction to the personal computer and DOS concepts, using the keyboard
- **Introduction to Essential Computer Skills:** PC commands, DOS commands for everyone, essential and advanced DOS commands
- **Advanced PC and DOS Skills:** meeting PC hardware, using a hard drive, using EDLIN (DOS line editor), important DOS applications (controlling DOS, CONFIG.SYS and AUTOEXEC.BAT), software and applications (spreadsheets, word processing, etc.
- **Introduction to PC Hardware:** going inside the personal computer, system configuration and design
- **Introduction to Current Systems and Technology:** Windows 3.X, Windows 95

4.5 Computer Recycling & Repair Employment Training Environmental and Recycling Contents

A comprehensive curriculum should include environmental education components to qualify the students for working in recycling businesses as well as enrolling in extended environmental education or starting their own business.
Possible Contents:

- **Contents of a Computer:** focus back on the computer repair curriculum, materials and hazardous contents of computers and components
- **Recycling Laws:** what kind of materials are regulated;necessary knowledge about recycling and remain of computer components)
- **Flow of Recycling:** what components are recyclable, what parts are worth selling to commercial recyclers, why (and how much) they pay, what happens with the parts at the companies, subcontracting, reselling or remanufacturing?
- **Hazardous Materials:** what computer components are considered hazardous waste, how to handle them, safety and emergency response, impact on the environment
- **Recycling Business:** decisions about recycling - is it worth it to recycle? management aspects: amount of intake and exit of (donated) computers, amount of repairable computers, recipients for the working/upgraded computers (re-selling/donating), necessary labor force and warehouse space, amount of recyclable components, comparing cost and income
- **Environmental impacts:** what happens when you do not recycle computers—waste in landfills, costs, environmental impact, selling obsolete computers or components (with hazardous materials) abroad/globalization

Field trips such as visiting commercial recyclers (subcontractors), landfills or other companies and programs could be included in the environmental training. Suggested time is 40 hours

5. Employment Opportunities

Local employers and temp agencies offer a variety of jobs for technicians with solid repair and basic software skills.

Although the job titles are different, the responsibilities and the requirements are similar. Entry level skills for available jobs are similar to those gained in the curriculums offered by ROP and CompTIA. Computer repair, setup, configuration, installation, troubleshooting, upgrading and basic software skills, as well as extended software skills, are the most frequently requested skills. Besides technical skills, employers also request strong communication, customer service and problem solving skills. Most jobs require 1 to 5 years of work experience, a driver's license and the ability to travel and work

evenings or weekends.
 Examples of employment positions:
- **Computer Service Technician/Computer Systems Technician:** build and upgrade computer systems from the ground up, set up and configure hardware, install and troubleshoot operating systems and software packages.
- **Systems Technical Analyst/Network Technical Analyst:** technical support for server systems/the network, troubleshooting or installation problems using Network Management system tools.
- **Technical Support Engineer/Customers Engineer Specialist:** diagnose installation, configuration, integration and application development problems, warranty repairs, customer support, troubleshooting, assistance and training.
- **Desktop Support Technician/Help Desk Manager/Help Desk Analyst:** solving hardware and software problems, comprehensive desktop support and maintenance information, troubleshooting.

5.1 Extended Training Opportunities

Examples of extended education courses:

City College
Computer Programming   (1 year)
Computer Science   (2 years)
Microcomputer User Support   (1 year)
Multimedia Programming   (2 years)
Networking /Telecommunications   (1 year)
UNIX/Open Systems   (1 year)
Programs confer a certificate or A.S. , cost: $ 13 per unit
(1 year = 12 units)

Heald College
Computer Technology
Electronics Technology
Programs are 6 quarters, day or evening classes (1 quarter = 12 weeks)

Computer Business Administration
Computer Office Administration
Programs are 6 quarters for day classes, 8 quarters for evening classes

Networking Technology, Microsoft, Windows NT
Networking technology, Novell Netware
Day and evening program of 2 quarters

All of the above mentioned programs confer a Heald's

Diploma.
Program fees are $ 2,220 per quarter for day programs and $ 1,725 per quarter for evening

Computer Learning Center
Network Engineering and Management   (720 hours)
Computer Programming   (800 hours)
Computer Programming Technology   (1,800 hours)
Computer Applications and Network Administration (1,800 hours)
Information Technology and Network Support   (1,800 hours)

All programs are provided as morning and evening classes and confer a diploma. Estimated cost is between $ 3,800 and $ 19,000.

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The mission of the Materials for the Future Foundation is to support community-based initiatives that integrate the environmental goals of resource conservation through waste prevention, reuse, and recycling with the economic development goals of job creation/retention, enterprise development, and local empowerment. Our work focuses on low-income communities, communities of color and areas of high worker displacement, especially in the San Francisco Bay Area.