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ABSTRACT

This guide provides information on how to provide equitable technology education. The first section, "Identifying Inequities in Technology," presents inequities in access, in type of use and in the curriculum. The second section, "Finding Solutions," describes a planning process to help educators tap the commitment to equity of individuals in the school or district, discusses how to address equity in a school plan, and emphasizes the need to collect information on computer laboratory usage and course enrollments. It also includes strategies for addressing inequities based in the author's review of the literature. The following section "Using Additional Resources" includes information on adaptive technology, funding, assessment of materials and programs, mentors, online equity sites, and technology mini-grants. The guide concludes with a glossary of terms, a bibliography, and checklists and data collection forms for easy duplication. (AEF)

CLOSING THE EQUITY GAP IN TECHNOLOGY ACCESS AND USE

A Practical Guide for K-12 Educators

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About CNORSE The Center is one of 10 regional desegregation assistance centers funded by the U.S. Department of Education to provide equity training and technical assistance within the larger context of school improvement. The Center serves public school personnel, school board members, students, parents, and other community members in Region X–the Northwest (Idaho, Oregon, and Washington), Alaska, and the Pacific, including American Samoa, Guam, Hawaii, the Commonwealth of the Northern Mariana Islands, and the Trust Territory of the Pacific (Palau).

About NETC The Consortium provides professional development opportunities and access to technical assistance and support for collegial interaction that allows and encourages educators throughout its region, and especially in K-12 schools, to become informed and fearless users of technology and to integrate electronic technologies into the teaching/learning process. NETC also promotes students having access to technology when and where they learn. The members of the consortium include the six state education agencies of Alaska, Idaho, Montana, Oregon, Washington, and Wyoming, Education Service District 101 in Spokane, Washington, and the Northwest Regional Educational Laboratory as the lead grantee.

About the Author Barbara Warren-Sams has been an information/publications specialist with NWREL since 1981. She has worked in educational equity at NWREL for over 18 years, beginning with several Women's Educational Equity Act projects including *Hand in Hand: Mentoring Young Women.* She has written or contributed to a wide diversity of equity products such as training materials, training manuals, newsletters, and videotape scripts. In 1992 she authored *Ideas for Action: Helping Girls and Young Women in Your Community* for the Oregon Girls and Young Women's Project. In her current position with the Center for National

Origin, Race, and Sex Equity, she develops products, serves as editor of the *Equity Infoline*, coordinates the Center's annual conference, and assists with providing training and technical assistance to local education agencies in the Northwest, Alaska, and Pacific Islands.

Warren-Sams has also worked as writer/editor in NWREL's Education and Work Program where she served as editor of the *Tech Prep Networker* and *Northwest Connections* newsletters and assisted with the Northwest Workplace Basics project and a statewide evaluation of professional technical education in Oregon.

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CLOSING THE EQUITY GAP IN TECHNOLOGY ACCESS AND USE

A Practical Guide for K-12 Educators

Barbara Warren-Sams

June 1997

NORTHWEST REGIONAL EDUCATIONAL LABORATORY
Center for National Origin, Race, and Sex Equity
Northwest Educational Technology Consortium

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PREFACE

Closing the Equity Gap in Technology Access and Use is the result of a collaborative project conducted in the summer and fall of 1996 by the Center for National Origin, Race, and Sex Equity (CNORSE) and the Northwest Educational Technology Consortium (NETC). In response to growing inquiries about how to provide equitable technology education, NETC called on the expertise of CNORSE to develop the content for an equity home page on its Web site. CNORSE conducted and synthesized a literature review of equity in computer use and other educational technology, and NETC designed its presentation on the Internet.

This guide provides the same information with some editorial changes and in a slightly different format for those who may not yet have Internet access. If you are able, we encourage you to visit the Internet version as well. Point your browser to http://www.netc.org/equity.

A feature of the Internet, not available in paper form, is the ability to receive a summary of your responses to the checklists for identifying inequities in technology education. In addition, the Internet is periodically updated and allows online users to make suggestions for improvements to the site and for including additional resources.

Appreciation is extended to NWREL staff who have provided information and guidance in the development of this publication: Dean Arrasmith, LaVonne Griffin-Valade, Joyce Harris, Jim Pollard, Joan Shaughnessy, and Carol Thomas. Special acknowledgment goes to Seymour Hanfling for conceptual guidance and support; Kristin Boden MacKay for technical support; Linda Fitch for research support; and John Ferrell for editorial review.

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INTRODUCTION

History does not suggest that equitable access to and use of the newest technologies will happen automatically or even easily.

– Delia Neuman, 1990

New technology, often thought of as a solution to problems, sometimes extends existing ones. In our society, the gap between those who know how to use technology and those who don't is increasing at a cost to both individuals and society. Technology has been referred to as a "second language" and those who don't learn this new language are at educational, economic, and social disadvantages. Because technology plays such a large role in modern society, all students need ample opportunities to learn how to use and enjoy it.

Researchers and practitioners alike recognize that the inequitable distribution and use of computers and other technologies:

- Appear at all educational levels
- Occur among districts as well as within and across schools
- Often result from inattention
- Endure indefinitely without planned interventions

Inequities are well-documented in research carried out over the past 15 years.

The present system for funding public education presents a formidable barrier to equal educational opportunity in technology. Districts and schools will continue to experience substantial differences in the financial and educational resources available to them. However, educators with a commitment to equity have done and can do much to lessen or overcome financial and other barriers.

Who Might Use This Guide

District planners, technology committee members, including community members and parents, curriculum planners or reviewers, and classroom teachers will all find valuable information here for identifying ways they can improve equity for students.

How It Is Organized

"Identifying Inequities in Technology" presents the inequities identified in technology access and use as a set of questions to increase your awareness of what the issues are. "Finding Solutions" describes a planning process to help you tap the commitment to equity of individuals in your school or district, discusses how you might address equity in a school plan, and emphasizes the need to collect information on computer laboratory usage and course enrollments. Finally, the section

includes lists of strategies for addressing inequities based in the author's review of the literature.

Following the two major sections is a collection of additional resources, including information on adaptive technology, assessment of materials and programs, funding, mentors, online equity sites, and technology mini-grants. The Guide concludes with a glossary of equity terms, a bibliography, and checklists and data collection forms for easy duplication.

How to Use It

The questions in the text enable you to take a comprehensive look at your practices to determine whether students are receiving equitable access to equipment and instruction. They serve as springboards for self-reflection.

The questions are also presented in a checklist format to allow you to assess to what degree you are providing equity in several issue areas. The checklists may be used in observations or interviews with school staff, students, or others. Sample forms allow you to collect quantifiable data on computer laboratory usage and technology course enrollments. The forms can be used as is or adapted to fit your specific needs.

The strategy lists are not linked to a particular problem but provide strategies for dealing with access, use, and curriculum inequities. Each list is categorized further into areas of concern. For example, the access section offers strategies that address funding inequities, between-school inequities, the limited economic means of some students, and ways that school staff themselves can increase access.

Without consistent attention, equity is an illusive goal. The tools provided in *Closing the Equity Gap in Technology Access and Use* will assist you in focusing necessary and careful attention on whether all students benefit equally from district, school, and classroom use of technology.

Training Opportunities

CNORSE staff are available to conduct workshops on equity in educational technology. These workshops are free of charge to school districts in the program's service area. Staff also are able to present on this topic at local and regional conferences as budget and time allow. Contact Joyce Harris, CNORSE director, to request services (see inside front cover for address, phone, fax, and Internet information).

IDENTIFYING INEQUITIES IN EDUCATIONAL TECHNOLOGY

Introduction

The literature reveals three major areas in which inequities in technology can arise:

- **Access.** Physical access to available educational technologies varies greatly across districts and within schools. Funding differences between rich and poor school districts are substantial and result in less access to educational technology for lower-income and ethnic minority students.
- **Type of Use.** Unconscious stereotyping on the part of educators keeps them from challenging ethnic minority, lower-income, differently abled, and female students academically. Within schools, research shows that different groups of students use the computer in different ways. This indicates that school staff may play a role in perpetuating inequities.
- **Curriculum.** Often computer software contains gender or ethnic bias or both. Schools must make available to students a variety of software that meets the needs and interests of all students and makes them feel they belong in the world of computing.

To help you determine what you can do to help ensure equity in these areas, we have translated the issues identified in the research into a set of questions you can use to identify any problems (these questions are presented in the form of a checklist beginning on p. 32). The "Finding Solutions" and "Using Additional Resources" sections provide tools to help you begin to address any inequities you may uncover.

Inequities in Access

THINK ABOUT IT. If we are going to eliminate inequities, we need to examine some of the attitudes we hold that support their continuing existence. Read these usually unconscious and unstated attitudes that often contribute to unequal access for different groups of students. Are you holding any of them?

- Schools can't keep up with rapidly changing hardware and software; most students will learn what they need to know on the job.
- Most lower-income, ethnic minority, limited-English speaking or lower-achieving students will not proceed to higher education.
- We're doing okay because at least we're exposing *those kids* to some form of technology.
- All students are more or less equal in their ability to benefit from computer-based curricula.

NOW ASK YOURSELF THESE QUESTIONS.

District Level

1. Do schools serving mostly lower-income children have the same equipment and course offerings as schools serving mostly higher-income children?
2. Do schools serving mostly children of color have the same equipment as schools serving mostly white children?
3. Do you work to overcome existing access inequalities between schools?
4. Do you set minimum standards for technology in all district schools to ensure that all students have adequate access?
5. Do you work with your local site councils on equity in educational technology so that they understand the ramifications of their decisions?
6. Are schools with limited resources able to supplement existing courses or obtain full course offerings with distance learning technology?
7. Do a proportionate number of experienced teachers teach in schools with predominantly students of color, resulting in equal access to high-quality instruction?

School Level

1. Do all students and parents or guardians, especially those from special populations groups, receive a clear message from all levels–teachers, counselors, administrators–that technology literacy is valuable for all students?
2. If you track students, do you provide students in the general and professional-technical tracks with the same access to educational technology as those in the academic track?

School Level, cont'd.

3. Are computers housed in a variety of locations so that they are available to all students and for diverse uses?
4. Are students without computers at home or who do not participate in private computer camps provided access to equipment and instruction to mitigate this disadvantage?
5. If students without certified learning differences bring laptops to school, have you examined whether this creates any academic disadvantage for other students?
6. Are students with disabilities provided with assistive devices so they are able to use available equipment?
7. Do limited English speaking students have access to software programs and instruction in their first language or in an English as a Second Language (ESL) environment?
8. If the school has limited equipment, is its use available to all students, not only the gifted or those needing basic skills assistance?
9. Are all teachers adequately trained to use technology as part of their teaching?

Inequities in Type of Use

THINK ABOUT IT. If we are going to eliminate inequities, we need to examine some of the attitudes we hold that support their continuing existence. Read these usually unconscious and unstated attitudes that often contribute to usage differences among different groups of students. Are you holding any of them?

- Girls and ethnic minority boys don't like programming.
- Some students don't need to be "pushed" to learn programming.
- For some students, knowledge of applications is sufficient to compete for "appropriate" jobs in our technology-based workplace.
- Children with special needs require drill on the basics before they are capable of moving on to higher-order thinking or problem-solving (programming) activities. Or, they need computing activities that are fundamentally different from other students.
- Integrated learning or computer-managed instructional systems are the best way to use computers with lower-achieving students.
- The primary benefit of computers for lower-achieving students is mastery of basic skills.
- Some students gain computer literacy through game programs instead of computer-mediated curricula.
- Boys are more interested in computers and other technology than girls.
- Girls are not interested in computers because they associate them with math, machines and programming (in which they are also not interested). Or, girls are only interested in what a computer can do, not a computer as an object of study.
- Speediness is an important component of intelligence and achievement.
- Better behaved students deserve additional computer time.

NOW ASK YOURSELF THESE QUESTIONS.

District Level

1. Do students in schools with high numbers of students of color have an opportunity to use computers in the same way as students in schools with high numbers of white students?
2. Do students in schools with high numbers of lower-income students have an opportunity to use computers in the same way as students in schools with high numbers of higher-income students?

School Level

1. Do all students, regardless of academic ability, income level, race, gender, English-speaking ability, and physical condition, have an opportunity to use computers for higher-level cognitive activities? In other words:
   a. Do lower-income, lower-achieving, and ethnic minority students use the computer for high- as well as low-level cognitive tasks (drill and practice)?
   b. Do lower-achieving students use the computer to solve problems and learn applications as well as to learn basic skills?
2. Are females and students of color proportionally represented in elective and advanced programming classes? Have unnecessary prerequisites been eliminated?
3. Are females and males equally represented in applications (word processing) classes?
4. Do all groups have equitable access to the computer laboratory before and after school and during other free times?
5. Does all groups use computers before and after school and during other free times?
6. Are the most competent and experienced teachers assigned to teach lower achievers as well as higher achievers and the gifted?
7. Are younger students made aware of technology careers and technology education classes available in high school?
8. Do high school students not enrolled in technology programs have sufficient flexibility to allow them to consider taking technology courses as electives?
9. Are all parents or guardians educated about the importance of technology skills for their children?
10. Are all groups of students represented in computer clubs?

Classroom Level

1. Are you aware of stereotypes you hold or students hold that may influence who does what with computers in your classroom?
2. Do you examine stereotypes that may keep you from challenging some students academically?
3. Do you create an environment that says the study of technology is appropriate for all students?
4. Do you hold high expectations for all students and provide them with equal opportunities to use computers in diverse ways?
5. Do you encourage or require all students to demonstrate proficiency with computers and other technology?
6. Do you ensure that no group of students is allowed to dominate computer use?
7. Do you avoid allowing extra time at the computer as a way of rewarding students for early completion of their work or good behavior?
8. Have you taken steps to make yourself comfortable with the use of computers and other technology?
9. Do you relate learning technology skills to the world outside of school and to jobs?
10. Do you provide students with female and diverse racial and cultural role models in technology-based careers?
11. Do you counter negative labels like "computer nerd" or negative attitudes like "it's not cool"?
12. When you assign work, are you sensitive to the fact that many students do not have access to a home computer or the Internet?
13. Do all students have an opportunity to fill leadership roles such as class assistant or tutor?

Inequities in Curriculum

THINK ABOUT IT. If we are going to eliminate inequities, we need to examine some of the attitudes we hold that support their continuing existence. Read these usually unconscious and unstated attitudes that often contribute to the use of biased materials. Are you holding any of them?

- Bias in materials isn't an important issue.
- Recently developed materials don't contain bias.
- Biased materials have already been weeded out of our collection.

NOW ASK YOURSELF THESE QUESTIONS.

District and School Level

1. Do all curricular offerings incorporate various levels of technology use?
2. Have unnecessary prerequisites to courses or programs been eliminated?
3. Has the existing collection been screened for bias?
4. Do software evaluation forms screen for gender and ethnic bias?
5. Are software screeners and purchasers trained in bias issues?
6. Is instructional software sought that meets the needs and interests of limited English speaking, ethnic minority, differently abled, and female students? For example:
   - Shows both boys and girls from varying ethnic backgrounds in diverse roles
   - Is available in more than one language
   - Allows for different learning styles
   - Accommodates varying ability levels
   - Addresses the needs of differently abled students

FINDING SOLUTIONS

Planning for Equity

Achieving equity will not happen automatically or even easily. To make equity a reality, you will need to be proactive; you will need to plan. Below are steps that your district and school can use to help ensure that all students gain technological proficiency.

At the Administrative Level

1. Encourage district to develop policies and guidelines on the equitable acquisition and use of technology by district schools
2. Establish school policies that ensure all students gain exposure to new technology
3. Make recommendations for equipment purchases after analyzing how to best meet the diverse needs of all students

To Engage Staff and Community

4. Make staff and parents aware of equity issues in technology and enlist their help in overcoming any barriers.
5. Form an equity committee or equity subcommittee of the technology committee to develop, implement, and evaluate technology access and use issues in your school. Make a conscious effort to ensure diverse committee membership (gender, ethnicity, national origin, age, occupation, and differently abled). Potential activities for this committee include:

   - Establish a process for reviewing software and related curricula for gender and ethnic bias and instructional value
   - Monitor technology course enrollments and computer lab usage on a regular basis and disaggregate resulting data by gender, ethnicity, English speaking proficiency, mobility status, income level, and ability level
   - Research which strategies encourage all students to participate in technology courses and activities; then devise recruitment and retention strategies based on interest and ability for traditionally underrepresented groups
   - Seek ways to have parents and peers support the interest of underrepresented groups in technology learning
   - Devise a plan for training staff to become technology literate and to use technology in their classrooms
   - Periodically review and evaluate practices to ensure equity and revise as necessary

If your district or school already has a technology plan, review it to ensure that equity is one of its major goals. For example, a school's plan might include "Provide equity of access for all students" in its technology plan and identify the following objectives to achieve that goal:

Objective 1: Decisions concerning placement of equipment will be made to ensure availability to a wide range of students.

Objective 2: Labs will be open and supervised before and after school and during free times to provide opportunities to students who do not have access to technology outside of school.

Objective 3: Opportunities to use technology will exist throughout the curriculum to ensure availability to a wide range of students.

Objective 4: Special needs students will have an adult representative on the Technology Committee.

Objective 5: Technology Mini-grant proposals will be expected to provide for equitable benefits on the basis of socioeconomic level, skill level, language status, racial or cultural identity, gender, and disability status.

Objective 6: Race and gender balance in computer classes and during free time will be a high priority. Equity measures currently in place will be regularly reviewed.

A plan that has clear objectives, is based on data collected at your site, provides for evaluation of its effectiveness by a given date, and has staff approval and input from student leadership has a better chance of success than a plan that lacks these elements. Here is a sample plan with these elements that addresses inequities in free-time computer lab use:

Data collected prior to plan	Informal observations have revealed that white, middle- or upper-class males dominate free-time computer lab use.
Evaluation built into plan	Formal observations will be carried out to document the problem and its true extent. A staff member will collect data on free-use times during four two-week periods and graph the results.
Clear objectives	It is our objective to attract more students to the computer lab during free time by: 1. Improving the atmosphere in the lab during free time 2. Working to raise awareness among selected groups of students about the availability of the lab

3. Working to raise awareness among students about the issue of equity in access to technology

To address our first objective, we will:

- Reserve Room C2 as a quiet work place during free time (before school, after school, lunch time, and break time); interaction will be allowed only in Room C1
- Discontinue game playing and "game days"
- Require students who use applications involving sound to wear headphones

To address our second objective, we will use several means to publicize the computer laboratory: (1) post bulletins in all classrooms; (2) do a display on one hallway bulletin board; (3) make short presentations in selected classrooms; and (4) send a notice to parents about the computer lab and translate this notice into other languages as appropriate.

To address our third objective, we will ask advisors to help raise awareness of equity issues regarding computer lab use among students.

Staff approval and student input

This plan has been approved by the Steering Committee and staff and has been developed with input from student government.

Effective plans depend on knowing exactly what the problem is. That is why collecting data about course enrollments and equipment usage is so important. To facilitate your data collection, we have included forms on computer laboratory usage and technology course enrollment to use as is or adapt to your particular circumstances. You'll find them in the "Checklists and Forms for Duplication" section. These forms can be used by staff as well as others to determine where inequities occur in your district or school. For information on other data collection forms, look under "Materials and Program Assessment" in the "Using Additional Resources" section.

Addressing Access Inequities

Districts and schools with limited funds for hardware and software can stretch their budgets in a variety of ways. In his Technology & Learning *article, G. Jordahl encourages districts and schools to be creative and offers the following suggestions:*

- ✔ Check to see whether consumable materials might be replaced by technology and put the savings into the technology budget
- ✔ Seek high tech business partners who often are interested in helping out local schools; the local chamber of commerce can help you contact organizations that are willing to provide schools with financial assistance or volunteer assistance for staff training, laboratory supervision, etc.
- ✔ Check with the U.S. General Services Administration office in your region about their computer donation program
- ✔ Write grants to receive public and private support
- ✔ Conduct special purpose fund-raising events
- ✔ Form a foundation so that companies and individuals who donate equipment, services, software or cash can receive a tax write-off
- ✔ Seek hardware and software donations that meet your needs
- ✔ Find out what skills parents or guardians have that might be used in your programs
- ✔ Establish or join a consortium to help stretch resources even further
- ✔ Explore new uses for older technology, e.g., older computers can become part of a writing lab
- ✔ Investigate ways to sell, donate, or trade-in old equipment, e.g., hold a garage sale
- ✔ Use laptops for word processing and purchase only a few state-of-the art computers for more sophisticated uses
- ✔ Consider leasing equipment. According to Len Scrogan in *Outmaneuvering Obsolescence*, you need to ask whether you have (1) predictable funding; (2) programs that require constant supply of state-of-the-art technology; (3) a technology plan that requires more hardware than existing funds can purchase; (4) staff that need considerable time to learn new technology; and (5) no plan to recycle older technology for different purposes
- ✔ With many schools and a limited budget, explore networking options for local and wide-area use

District administrators can lessen inequalities between schools:

- ✔ Survey schools within your district to determine differences in amount of equipment, type of equipment, and number and type of course offerings; decide whether the differences are substantial enough to constitute unequal access
- ✔ Based on results of the survey, enact a district policy which outlines a minimum technology plan that offers all students the opportunity to become computer literate as defined by the district; be sure to require staff training and frequent assessment of the plan
- ✔ Develop a plan or set of strategies for assisting individual schools to meet the requirements of the district policy

Because some students and families have limited economic means, schools can provide opportunities to increase the access of these students. Sample activities might include:

- ✔ Hold a lab night where students and parents work together at computers (provide child care)
- ✔ Schedule activities during the day for parents who are at home during the day, have other children at home during the evening, or have concerns about going out at night
- ✔ Have loaner equipment that can be borrowed for a specific amount of time; this could include computers, instructional videos, and hand-held calculators
- ✔ Have loaner instructional software
- ✔ Investigate a telecommunications hook-up between homes and school if the equipment and skills are at hand (electronic encyclopedias could be made available for home use in this manner)
- ✔ Keep labs open before and after school, in the evenings, during the summer (in conjunction with summer school); use volunteers to staff and supervise these additional hours
- ✔ Seek funds to serve groups with limited economic means
- ✔ Partner with the public library to make your equipment available to students during the summer
- ✔ Offer programming or video production classes as part of a latch-key program

School staff can increase the access to educational technology of all students:

- ✔ Offer computer or other technology classes for staff so that all staff are competent users of educational technology and can integrate new technologies at various skills levels
- ✔ Be advocates for equity; take notice and speak up when you see inequities of access or use. For example:
  - ■ Survey the location of computers within your school and monitor who uses them
  - ■ Monitor use of the computer laboratory during free times
  - ■ Monitor whether all students have opportunities to go on "electronic" field trips or use networking to participate in collaborative projects
  - ■ Monitor whether different groups of students are proportionally represented in interactive TV courses
- ✔ Develop a plan to integrate diverse uses of computers and other educational technology across the curriculum, e.g., technology mini-grants to help teacher find ways to use technology in their classrooms
- ✔ Identify a staff member who can help all teachers integrate the computer or other technology into their classrooms
- ✔ Locate computers in central supervised location(s) or have them available in all classrooms; if computers are located in a central area periodically monitor their use, post rules for use and enforce them; and if necessary, reserve special times for their use by underrepresented user groups
- ✔ Educate parents or guardians about the rewards of being computer literate. Suggestions include:
  - ■ Listen to children when they want to talk about how they use computers at school and acknowledge their accomplishments
  - ■ If possible, purchase or borrow computer magazines
  - ■ If you have one, encourage use of home computer, especially for female children
  - ■ Enroll children in computer camps and after-school programs and seek financial assistance if it's needed
  - ■ Initiate talking about computers and other technology
  - ■ Express high expectations of your children regarding technology, science, and mathematics
- ✔ Develop classes for parents or guardians to help them become computer literate

- ✔ If time and interest allow, become computer literate (using the school as a resource)
- ✔ Have families work together on computer-based learning programs

Addressing Type of Use Inequities

If differences exist in how groups of students use computers in your district, form an ongoing committee or task force. This committee would be charged with devising a district plan to address the inequities and to keep the issue alive at the district level. Suggested tasks include:

- ✔ Establish a rationale for why equity in educational technology is an important issue
- ✔ Gather usage and course enrollment data by school and disaggregate on basis of race, gender, language status, disability status, and income level
- ✔ Analyze these data to determine extent of usage inequities
- ✔ Gather information on any intervention strategies currently in place in district schools
- ✔ Issue a report of findings with recommendations for change
- ✔ Based on the report, incorporate into the district technology plan short- and long-range goals to achieve equity
- ✔ Assist individual schools to develop their own plans with short- and long range-goals for equity
- ✔ Collect and disseminate information on promising intervention strategies

If you believe there are difference in how groups of students use computers in your school, you can:

- ✔ Study the usage gaps between male/female, native English/limited English speaking, white/minority, nondisabled/disabled, higher achieving/lower achieving, higher income/lower income, and academic/vocational students
- ✔ Make staff aware of any unacceptable computer usage gaps at your school, e.g., talk about it at a faculty meeting, put articles in mailboxes, or ask staff to stop by the lab and see for themselves
- ✔ Ask staff for their ideas on how to shrink the gap
- ✔ Make certain that faculty have adequate access to computers; have an evening or weekend lending program
- ✔ Evaluate staff on whether they incorporate computer use in their classes

- ✔ Provide information on interaction disparities and have teachers videotape themselves to discover inequitable patterns of interacting with students or allow them to observe each other
- ✔ Make a plan and start addressing the inequities in your school; don't try to solve all the issues at once; be patient but persist toward your final goal
- ✔ Schedule classes for targeted groups, for example, word processing or programming for ESL students
- ✔ Recruit ethnic minorities, females, and personnel with disabilities as instructors and club advisers
- ✔ Remove unnecessary prerequisites to programming courses so that more students can participate
- ✔ Use formal and informal counseling or publicity to inform targeted students and their families of the appropriateness of computers for them; let them know that they can master technology and pursue technology-based careers
- ✔ Bring expertise to the school; invite speakers and role models that represent a diversity of ethnic and cultural backgrounds, both sexes and all abilities
- ✔ In the computer laboratory, devise a sign-up system that provides all groups equitable access (don't use first come, first served method); make certain that the computer laboratory is an appealing environment for all students; encourage targeted groups to try programming during free time; select targeted group members as computer laboratory monitors; monitor pairs of students to ensure that both are learning and using
- ✔ Recruit targeted groups for elective computer classes
- ✔ Recruit targeted students in groups to lessen influence of peer pressure
- ✔ Require introductory computer classes of all students and stress usefulness of computers
- ✔ Offer a variety of classes that incorporate many types of computer uses
- ✔ Attract resistant students with uses that appeal to them; use a short lunch session or mini-course on graphics as a hook
- ✔ Hold a computer fair and make sure that diverse cultural and racial groups and women are well represented as speakers and vendors
- ✔ Provide teachers adequate time to plan and evaluate computer-based activities for their students so they are comfortable using them

- ✔ Make certain your computer lab is a learning center for all students, not a place for a few to play games
- ✔ Establish computer clubs that meet the needs of all students

If you want to increase equity within your classroom, you can:

- ✔ Become a comfortable and proficient computer user
- ✔ Use peer tutoring in ways that encourage mentored students to learn computers and technology; as students gain skills, they can become peer tutors (they don't need to be experts)
- ✔ Require all students to spend a minimum amount of time in the computer lab each week
- ✔ Invite speakers and role models to your class that represent a diversity of ethnic and cultural backgrounds, both sexes, all forms of abilities
- ✔ Start a student computer committee and have them help with ideas for ensuring equitable use among all groups; be sure you use their ideas
- ✔ Make sure that all students get equal time at the computer
- ✔ Make sure pairs of students take turns keyboarding; pair assertive students together
- ✔ Pair students with disabilities with nondisabled peers
- ✔ Monitor male/female pairs to make sure of equal use
- ✔ Make sure all students have a chance to answer questions that require reasoning or problem solving
- ✔ Monitor your use of task-oriented versus nonspecific reinforcement
- ✔ Avoid asking technical questions only of certain students
- ✔ Frequently assign targeted groups extra duties, e.g., booting the computer before class, reading computer magazine articles, previewing software
- ✔ Give females practice in nontraditional tasks
- ✔ Use nonbiased language to reflect that technology is for everyone
- ✔ Start a support group or club for targeted students that taps an interest technology addresses
- ✔ Explore how computers can accommodate the diverse learning styles of students
- ✔ Use the computer to provide a collaborative environment where students of different levels of language proficiency interact meaningfully

- ✔ Give students assignments that show you value and approve of their interest in computers and other technology
- ✔ To begin with, allow students to use technology for activities that interest them; later introduce more advanced uses
- ✔ Have students examine software for bias as a class activity

Addressing Curriculum Inequities

Districts and schools can incorporate the following suggestions into purchase and review processes:

- ✔ Inventory software collection to ensure that it is broad-based and meets the needs of all students
- ✔ Expand role of textbook selection committee to include evaluation of computer software
- ✔ Add bias as a criterion on evaluation forms; evaluate software for bias in the same way you evaluate other instructional materials; examine language, proportional representation, roles of females, people of color, and people with disabilities
- ✔ Train those who select software to be aware of bias
- ✔ Have representatives of target groups preview software for appropriateness
- ✔ Check software for stylistic characteristics that may appeal more to males than females, or one ethnicity or culture than another. For example:
  - ■ Doesn't move too fast or too slow
  - ■ Provides immediate or timely feedback
  - ■ Require cooperation
  - ■ Allows independent work and work with peers
  - ■ Is balanced between open-ended and structured items
  - ■ Fosters creativity
  - ■ Is nonjudgmental
  - ■ Allows for a sense of achievement
  - ■ Involves tasks that are valued by students
- ✔ Let vendors know about objectionable software
- ✔ Purchase software that accepts input from alternative keyboards and pointing devices
- ✔ Pressure software developers to produce nonbiased materials
- ✔ Use media specialists, who usually have experience and expertise in this area, to tackle curriculum inequities

- ✔ Identify and remove overt and subtle bias from curricula and course outlines by addressing:
  - Absence of programming instruction and enrichment activities in business and vocational courses
  - Unnecessary prerequisites that restrict computer use to gifted and specially talented in mathematics
  - Curricular offerings for girls in nonacademic tracks that lead to low-paying computer operator jobs versus drafting and accounting applications
  - Lack of special software or adaptations of regular software for students with disabilities
- ✔ Develop curricula for hands-on projects that can be co-taught by a technology teacher and a classroom teacher or guidance counselor; make equity part of the curricula

USING ADDITIONAL RESOURCES

Adaptive Technology and More

Do you need information about adaptive technology for students with disabilities? Visit the EASI (Equal Access to Software and Information) Web site for help in making information and facilities accessible with the use of state-of-the-art assistive devices. The site also includes information on online and onsite workshops, EASI's science, engineering, and math project, and how to design an accessible Web page. For more information, contact EASI by e-mail, easi@educom.edu or by Internet, http://www.rit.edu/~easi/

Funding

Are you seeking additional funds for equipment and software? Here are some resources for obtaining funding from state and federal grants or private foundations

- *Aid for Education*, semimonthly newsletter on education funding and news, CD Publications, 8204 Fenton St., Silver Spring, Maryland 10910, 800/666-6380.
- *The Annual Register of Grant Support*, Marquis Who's Who, Inc., 200 East Ohio St., Chicago, Illinois 60611.
- *The Foundation Grants Index*, The Foundation Center, 79 Fifth Ave., New York, New York 10003, 800/424-9836.
- *National Directory of Corporate Charity*, The Foundation Center, 79 Fifth Ave., New York, New York 10003, 800/424-9836.
- "Grants, Contests, Etc.," monthly feature of *Technology & Learning* magazine.

Here are some resources that, according to Gregory Jordahl and Anne Orwig in *Technology & Learning* (April 1995), have been used effectively by parent-teacher organizations to raise funds for technology:

- A+America, 5130 Industrial St., Maple Plain, Minnesota 55592, 800/557-2466.
- The Computer Learning Foundation, 2431 Park Blvd., Palo Alto, California 94306, 415/327-3347.
- ITW Hi-Cone, 1140 West Bryn Mawr, Itasca, Illinois 60143, 708/773-9300.
- Innesbrook Wraps, P.O. Box 16046, Greensboro, North Carolina 27416, 800/334-8461.
- Market Day Food Co-Operative, 555 West Pierce Rd., Ste. 200, Itasca, Illinois 60043, 800/253-8169.

Is leasing for you? Check out *Outmaneuvering Obsolescence* by Len Scrogan (Institute for Effective Educational Practice, Boulder, Colorado, 303/661-9132.

Materials and Program Assessment

Have you been searching for resources to help you assess how well your materials and programs meet the needs of all students? Visit the *California Instructional Technology Clearinghouse* (http://tic.stan-co.k12.ca.us) for comprehensive guidelines on effective and equitable interactive technology resources. From the home page, select "Information about CITC, then "Publications and Projects," and finally "Guidelines for Interactive Technology Resources in California Schools.

Plugging In: Choosing and Using Educational Technology contains a section called "Instructions for Using the Learning and Technology Framework." Two charts (yellow section, page ix) are designed for assessing technology and technology-enhanced programs to promote engaged learning and high technology performance. Equity is part of the criteria. For an online copy of *Plugging In* contact http://www.ncrel.org/sdrs/edtalk/toc.htm

Technology: Indicators of Quality Information Technology Systems in K-12 Schools (1996) offers school a useful tool to assess "the quality of their work in behalf of student learning." Available from the National Study of School Evaluation in Schaumberg, Illinois, 800/843-6773.

Mentors

Are you thinking of using mentors as a way to increase students' interest in technology? For the past two years, CompuMentor has been supporting technology use in the San Francisco Unified School District by recruiting and placing computer mentors in schools. If you are interested in learning more or replicating the project, you can request a replication packet, available in both abbreviated whet-your-appetite or full-course meal versions. Contact Hilary Naylor, naylor@compumentor.org

Online Equity Sites

This is a beginning list. Please check our Web site at http://www.netc.org/equity for an updated list.

- *Equity Online* is a Web site of the Women's Educational Equity Act (WEEA) Equity Resource Center, a national center providing gender-fair multicultural materials, training, consulting, and referrals. You'll find information on the Center and WEEA Program grantees and information on educational equity. Contact http://www.edc.org/CEEC/WEEA.

  Items of interest include the WEEA Digest "Beyond Equal Access: Gender Equity in Learning with Computers" (up to 50 copies of digests are free of charge) and Project EXCEL in Fresno, California, 209/278-5303, fax: 209/278-7987, which has a focus on increasing competency in math, science, and computer technology.

- The Women in Technology Group at Harvard's Graduate School of Education discusses technological issues as they pertain to women and girls. Point your browser to http://gseweb.harvard.edu/TIEWEB/students/studentgroups/Student-groups.html.
- The National Clearinghouse for Bilingual Education (NCBE) disseminates information relating to the effective education of linguistically and culturally diverse (CLD) learners in the United States. Check out the Web site at http://www.ncbe.gwu.edu for links to other sites that address technology for CLD learners. For example, at http://www.ncbe.gwu.edu/links/biesl/ you can access information on (1) developing science, technology, and language literacy, (2) using computers to teach world languages to young students, (3) accessing school Web sites that share ideas and resources on CLD students, and (4) accessing other centers such as the Center for Multilingual, Multicultural Research at the University of Southern California, which addresses many issues including technology in education. At http://www.ncbe.gwu.edu/links/ tech.html, you can access a variety of sites, including the California K-12 Technology Information Project, Computer-assisted Language Learning, Teaching with Electronic Technology, and English Language Institute Technology Tip of the Month.

Technology Mini-grants

To help teachers explore how to use technology for successful teaching and learning, and if funds are available, a technology mini-grant program is one way to promote increased knowledge and equity. Individual teachers or teams of teacher may receive funds to develop and pilot new strategies or curricula involving technology. Grant funds may be used to purchase equipment as well as instructional materials or other needed items. Be sure to include in the grant requirements an item that asks proposed projects to explain how they will assess equity in terms of socio-economic level, skill level, language status, racial or cultural identity, gender, and disability status. Contact Steve Sax (541/687-3227, fax 541/683-7244 or sax@4j.lane.edu), Roosevelt Middle School, Eugene, Oregon, for details on its technology mini-grant program.

EQUITY GLOSSARY

Equality is *quantitative* and concerns parity among groups along some index, e.g., access to computers.

Equity is *qualitative* and concerns issues of justice; equity may demand inequality, being even-handed may not always be the answer. For some groups to have an even chance may require special efforts.

Sutton, R.E. (1991). Equity and computers in the schools: A decade of research. *Review of Education Research, 61*(4), 477, citing Secada, W.G. (1989). Educational equity versus equality of education: An alternative conception. In W.G. Secada (Ed.), Equity in Education (pp. 68-88). New York, NY: Falmer.

Equal Educational Opportunity. Its evolution as a legal concept:

- ***Early 19th Century:*** Access to the common school (free schooling for all children).
- ***First Half of 20th Century:*** Access to minimum education program (common curriculum); established vocational and college tracks; racial minorities and children with disabilities were often excluded or placed in separate facilities.
- ***After 1954 Brown vs. Board of Education Ruling:*** Equality of education opportunity depends in some way on effects or results of schooling (Brown ruled that separate wasn't equal because the results were likely to be different).
- ***Emerging from School Finance Litigation in 1990s:*** Access and outcomes consistent with a quality education.

Summarized from Mosburg, S. (1996, May). *How money matters to school performance: Four points policymakers should know.* Portland, OR: Northwest Regional Educational Laboratory. Appendix A, citing Verstegen, D.A. (1994). Reforming American educational policy for the 21st century. *Educational Administration Quarterly, 30* (3), 365-390.

Coleman argues that a reasonable approach to equal educational opportunity is "public schooling that leans in the direction of equal adult opportunities. Such a formulation implies that public schooling is to reduce handicaps that children face as a function of their early environments...."

Sutton, R.E. (1991). Equity and computers in the schools: A decade of research. *Review of Education Research, 61*(4), 493. Citing Coleman, J.S. (1977). What is meant by 'an equal educational opportunity?' *Oxford Review of Education, 1*(1), 28.

Equitable access to computers means:

- "Equal amounts of computer, regardless of sex, economic status, ethnic background, school achievement, and geographic locale
- "Appropriate activities for each special population
- "A full range of benefits of computer use including the development of both basic and high order cognitive skills as well as computer-specific skills
- "Opportunity for all children to recognize and receive social recognition for special skills and knowledge developed through work with computers"

Sharp, P., & Crist-Whitzel, J. (1985). *Computers for all children: A handbook for program design.* San Francisco, CA: Far West Laboratory for Educational Research and Development.

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CHECKLISTS AND FORMS FOR DUPLICATION

Checklist for Assessing Access Inequities in Educational Technology

Physical access to available educational technologies varies greatly across districts and within schools. Funding differences between rich and poor school districts are substantial and result in less access to educational technology for lower-income and ethnic minority students.

District Level

Always	Usually	Rarely	Never	To what degree are you addressing these issues?
☐	☐	☐	☐	1. Do schools serving mostly lower-income children have the same equipment and course offerings as schools serving mostly higher-income children?
☐	☐	☐	☐	2. Do schools serving mostly children of color have the same equipment as schools serving mostly white children?
☐	☐	☐	☐	3. Do you work to overcome existing access inequalities between schools?
☐	☐	☐	☐	4. Do you set minimum standards for technology in all district schools to ensure that all students have adequate access?
☐	☐	☐	☐	5. Do you work with your local site councils on equity in educational technology so that they understand the ramifications of their decisions?
☐	☐	☐	☐	6. Are schools with limited resources able to supplement existing courses or obtain full course offerings with distance learning technology?
☐	☐	☐	☐	7. Do a proportionate number of experienced teachers teach in schools with predominantly students of color, resulting in equal access to high-quality instruction?

School Level

Always	Usually	Rarely	Never	To what degree are you addressing these issues?
☐	☐	☐	☐	1. Do all students and parents or guardians, especially those from special populations groups, receive a clear message from all levels – teachers, counselors, administrators–that technology literacy is valuable for all students?
☐	☐	☐	☐	2. If you track students, do you provide students in the general and professional-technical tracks with the same access to educational technology as those in the academic track?
☐	☐	☐	☐	3. Are computers housed in a variety of locations so that they are available to all students and for diverse uses?
☐	☐	☐	☐	4. Are students without computers at home or who do not participate in private computer camps provided access to equipment and instruction to mitigate this disadvantage?
☐	☐	☐	☐	5. If students without certified learning differences bring laptops to school, have you examined whether this creates any academic disadvantage for other students?
☐	☐	☐	☐	6. Are students with disabilities provided with assistive devices so they are able to use available equipment?
☐	☐	☐	☐	7. Do limited English speaking students have access to software programs and instruction in their first language or in an English as a Second Language (ESL) environment?
☐	☐	☐	☐	8. If the school has limited equipment, is its use available to all students, not only the gifted or those needing basic skills assistance?
☐	☐	☐	☐	9. Are all teachers adequately trained to use technology as part of their teaching?

Checklist for Assessing Type of Use Inequities in Educational Technology

Unconscious stereotyping on the part of educators keeps them from challenging ethnic minority, lower-income, differently abled, and female students academically. Within schools, research shows that different groups of students use the computer in different ways. This indicates that school staff may play a role in perpetuating inequities.

District Level

Always	Usually	Rarely	Never	To what degree are you addressing these issues?
☐	☐	☐	☐	1. Do students in schools with high numbers of students of color have an opportunity to use computers in the same way as students in schools with high numbers of white students?
☐	☐	☐	☐	2. Do students in schools with high numbers of lower-income students have an opportunity to use computers in the same way as students in schools with high numbers of higher-income students?

School Level

☐	☐	☐	☐	1. Do all students, regardless of academic ability, income level, race, gender, English-speaking ability, and physical condition, have an opportunity to use computers for higher-level cognitive activities? In other words: a. Do lower-income, lower-achieving, and ethnic minority students use the computer for high- as well as low-level cognitive tasks (drill and practice)? b. Do lower-achieving students use the computer to solve problems and learn applications as well as to learn basic skills?
☐	☐	☐	☐	2. Are females and students of color proportionally represented in elective and advanced programming classes? Have unnecessary prerequisites been eliminated?
☐	☐	☐	☐	3. Are females and males equally represented in applications (word processing) classes?
☐	☐	☐	☐	4. Do all groups have equitable access to the computer laboratory before and after school and during other free times?
☐	☐	☐	☐	5. Does all groups use computers before and after school and during other free times?
☐	☐	☐	☐	6. Are the most competent and experienced teachers assigned to teach lower achievers as well as higher achievers and the gifted?
☐	☐	☐	☐	7. Are younger students made aware of technology careers and technology education classes available in high school?

Always	Usually	Rarely	Never	To what degree are you addressing these issues?
☐	☐	☐	☐	8. Do high school students not enrolled in technology programs have sufficient flexibility to allow them to consider taking technology courses as electives?
☐	☐	☐	☐	9. Are all parents or guardians educated about the importance of technology skills for their children?
☐	☐	☐	☐	10. Are all groups of students represented in computer clubs?

Classroom Level

☐	☐	☐	☐	1. Are you aware of stereotypes you hold or students hold that may influence who does what with computers in your classroom?
☐	☐	☐	☐	2. Do you examine stereotypes that may keep you from challenging some students academically?
☐	☐	☐	☐	3. Do you create an environment that says the study of technology is appropriate for all students?
☐	☐	☐	☐	4. Do you hold high expectations for all students and provide them with equal opportunities to use computers in diverse ways?
☐	☐	☐	☐	5. Do you encourage or require all students to demonstrate proficiency with computers and other technology?
☐	☐	☐	☐	6. Do you ensure that no group of students is allowed to dominate computer use?
☐	☐	☐	☐	7. Do you avoid allowing extra time at the computer as a way of rewarding students for early completion of their work or good behavior?
☐	☐	☐	☐	8. Have you taken steps to make yourself comfortable with the use of computers and other technology?
☐	☐	☐	☐	9. Do you relate learning technology skills to the world outside of school and to jobs?
☐	☐	☐	☐	10. Do you provide students with female and diverse racial and cultural role models in technology-based careers?
☐	☐	☐	☐	11. Do you counter negative labels like "computer nerd" or negative attitudes like "it's not cool"?
☐	☐	☐	☐	12. When you assign work, are you sensitive to the fact that many students do not have access to a home computer or the Internet?
☐	☐	☐	☐	13. Do all students have an opportunity to fill leadership roles such as class assistant or tutor?

Checklist for Assessing Curriculum Inequities in Educational Technology

Often computer software contains gender or ethnic bias or both. Schools must make available to students a variety of software that meets the needs and interests of all students and makes them feel they belong in the world of computing.

District and School Level

Always	Usually	Rarely	Never	**To what degree are you addressing these issues?**
☐	☐	☐	☐	1. Do all curricular offerings incorporate various levels of technology use?
☐	☐	☐	☐	2. Have unnecessary prerequisites to courses or programs been eliminated?
☐	☐	☐	☐	3. Has the existing collection been screened for bias?
☐	☐	☐	☐	4. Do software evaluation forms screen for gender and ethnic bias?
☐	☐	☐	☐	5. Are software screeners and purchasers trained in bias issues?
				6. Is instructional software sought that meets the needs and interests of limited English speaking, ethnic minority, differently abled, and female students? For example:
☐	☐	☐	☐	■ Shows both boys and girls from varying ethnic backgrounds in diverse roles
☐	☐	☐	☐	■ Is available in more than one language
☐	☐	☐	☐	■ Allows for different learning styles
☐	☐	☐	☐	■ Accommodates varying ability levels
☐	☐	☐	☐	■ Accommodates the needs of differently abled students

Computer Laboratory Usage Form 1

The purpose of this form is to give you a comprehensive picture and data about which students use the computer laboratory and how they are using it. Use the form to record observations of individual students. Provide as much information as you know about the student. You may need to check with an administrator, school secretary, counselor, or teacher to complete information for some of the categories such as income level, ability level, or language status. You can summarize these results on form 2.

For _____ School Year Date and Length of Observation _____

Name of School _____ School District _____

Student (Name or an I.D. #)	**Race/ Ethnicity** (AA, AI, API, EA, L, NI)	**Sex** (M, F)	**Income Status** (L, NL)	**Ability Level** (LA, HA)	**Language Status** (LES, NES)	**Other** (M, SD)	**Working Status** (WA, WIG)	**Activity** (P, PS, DnP, G, O)
TOTAL								
Legend:	AA=African American AI=American Indian API=Asian/Pacific Islander EA=European American L=Latino NI=Not identified	M=male F=female	L=low income NL=not low income	LA=lower achieving HA=higher achieving	LES=limited Eng. speaking NES=native Eng. speaking	M=migrant SD=student w/ disability	WA=working alone WIG=working in group	P=programming PS=problem solving DnP=drill and practice G=game O=other (identify)

Computer Laboratory Usage Form 2

Use this form to summarize the results of observations recorded on form 1.

For _____ School Year Date and Length of Observation _____

Name of School _____ School District _____

Student Group	Number Working Alone	Number Working with Others	Number Asking for Assistance	Number Engaged in Activity				Total
				P	PS	DP	G	
African American								
American Indian								
Asian/Pacific Islander								
European American								
Latino								
Not identified								
Female								
Male								
Low income								
Not low income								
Lower achieving								
Higher achieving								
Limited English speaking								
Migrant								
Student with disability								

Legend: P=programming
PS=problem solving, that is, the purpose is to teach or use problem-solving skills
DnP=drill and practice, the purpose is to practice a specific skill or set of skills over and over
G=game (exclusively for fun, does not have an educational purpose)

Technology Course Enrollment Form

Use this form to record the enrollment of formal courses as well as participation in other technology-related activities such as mini-courses, computer clubs, or technology fairs. Indicate the date and time of the course or activity.

For _____ School Year Date Completed _____

Name of School _____ School District _____

Student Group	Number in Course 1	Number in Course 2	Number in Course 3	Number in Course 4	Number in Course 5
African American					
American Indian					
Asian/Pacific Islander					
European American					
Latino					
Not identified					
Female					
Male					
Low income					
Not low income					
Lower achieving					
Higher achieving					
Limited English speaking					
Migrant					
Student with disability					
TOTAL					

Legend:	Course Title	Date(s)	Time (s)
Course 1:			
Course 2:			
Course 3:			
Course 4:			
Course 5:			

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
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