Objective 1.7: Schools use advanced technology for all students and teachers to improve education.

Our Role. The Department of Education has made great progress toward the goal to put modern computers in classrooms and connect them to the Internet. With increasing access to computers and advanced telecommunications, the Education Department must ensure that teachers also have the ongoing training and support they need to effectively use these investments for improved teaching and learning.

In response to this significant need, the Education Department's educational technology FY 2001 investments placed special emphasis on technology training for current and prospective educators. These funds help ensure that all new teachers can use technology effectively in the classroom. Closing the digital divide, particularly in communities with concentrations of disadvantaged students and their families, remains a challenge. Development of and access to next generation learning tools remains important to address critical education needs.

The Education Department's educational technology initiatives include, among others, the Preparing Tomorrow's Teachers to Use Technology program, the Technology Literacy Challenge Fund, the Technology Innovation Challenge Grant and Star Schools programs, the Community Technology Centers, and the Learning Anytime Anywhere program.

Our Performance

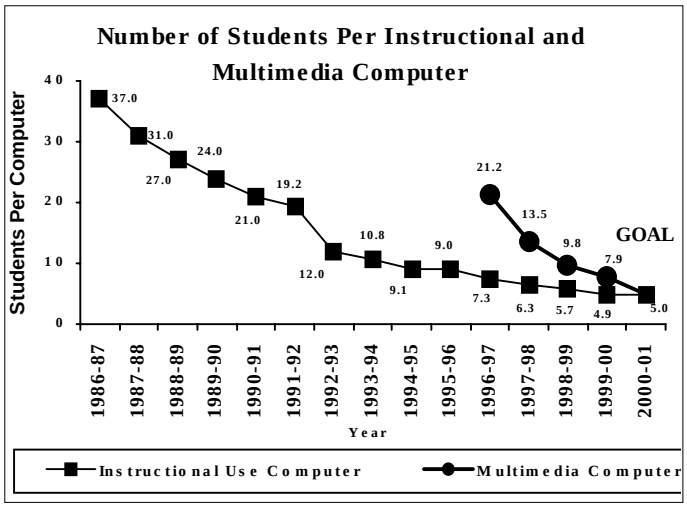
How We Measure. The Technology Literacy Challenge envisions a 21st century in which all students are technologically literate. To support schools in incorporating technology into their curriculum, teachers will need the training and support to help students learn using computers and the Internet; all teachers and students will have access to modern multimedia computers in their classrooms; every classroom will be connected to the Internet; and effective software and online learning resources will be an integral part of every school's curricula. These goals also provide the basis for performance indicators against which the Education Department measures the national progress in areas of educational technology supported by its programs.

Indicator 1.7.a. The ratio of students per modern multimedia computer will improve to 5:1 by 2001.

Assessment of Progress. The 1999-2000 data are consistent with the goal. Goals for this indicator are continual progress toward the 2001 goal of five students per multimedia computer. There are no new 2000-2001 data available.

To make technology a viable instructional tool requires that schools have enough computers to provide full, easy access for all students. Glennan and Melmed (1996), *Getting America's Students Ready for the 21st Century* (U.S. Department of Education, 1996) note that many studies suggest that full, easy access requires a ratio of about five students to each multimedia computer. As shown in Figure 1.7.a.1, in 1996-97, the ratio of students per *instructional* computer was 7.3:1; by 1999-00, the ratio had dropped to 4.9:1. In 1996-97, the ratio of students per *multimedia* computer was 21.2:1; by 1999-00, it had dropped to 7.9:1. As the cost of computing power continues to decline, schools are increasingly able to afford multimedia computers and the newer hand-held technology devices.

Figure 1.7.a.1



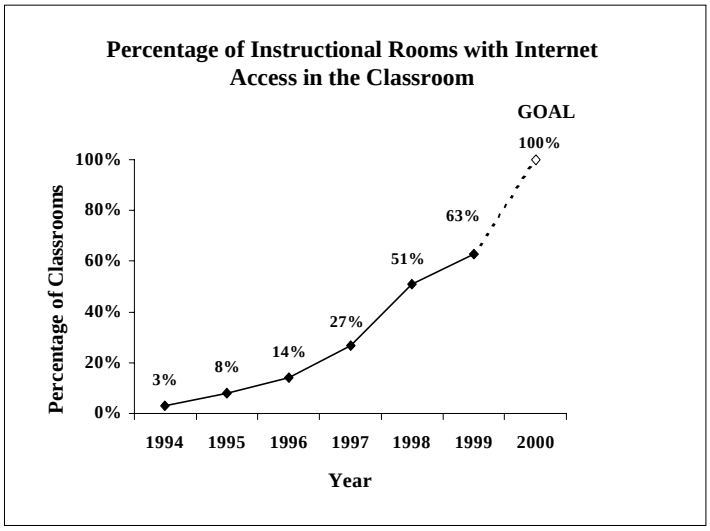
Source: Market Data Retrieval, *Technology in Education*, 1997, 1998, and 1999; Market Data Retrieval, 1997 as cited in Education Week, *Technology Counts*, 1997; *Nation's K-12 Schools make major gains in technology. Minority and low income schools lag behind.* Nov. 12, 2000, MDR press release (http://www.schooldata.com/pr22.html) accessed 2/28/01. *Frequency:* Annual. *Next Update*: fall 2001 for the 2000-01 school year. *Data for 2000 is from "Nations K-12 Schools make major gains in technology. Minority and Low Income Schools lag behind", MDR, Nov. 12, 2000.* **Validation procedure:** Data supplied by Market Data Retrieval. No formal verification or attestation procedure applied. **Limitations of data and planned improvements:** Market Data Retrieval data do not have consistently high response rates, and response rates vary substantially across sites. Accuracy of responses may vary considerably across districts and states. *Planned improvements:* None.

Indicator 1.7.b. The percentage of public school instructional rooms connected to the Internet will increase to 100 percent by 2000.

Assessment of Progress. There is positive progress toward this goal although it was probably not met. There are no 2000 data available.

Connections to the Internet make computers versatile and powerful learning tools by introducing students and teachers to new information, people, places, and ideas from around the world to which they might not otherwise be exposed. Figure 1.7.b.1 shows that in 1994 only three percent of instructional rooms were connected to the Internet. By 1999, 63 percent of classrooms were connected to the Internet.

Figure 1.7.b.1

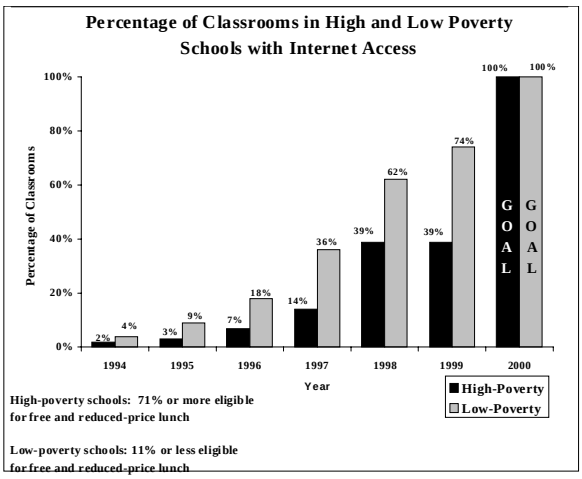


Source: National Center for Education Statistics (NCES), Internet Access in U.S. Public Schools and Classrooms: 1994-99, February 2000; Internet Access in U.S. Public Schools and Classrooms: 1994-1998, February 1999. *Frequency:* Annual. *Next Update:* spring 2001 for fall 2000 data. **Validation procedure:** Data validated by NCES's review procedures and *NCES Statistical Standards.* **Limitations of data and planned improvements:** The measure looks at access to the Internet, but does not look at Internet use or the quality of that use. *Planned improvements:* None.

Indicator 1.7.c. Students in high-poverty schools will have access to educational technology that is comparable to the access of students in other schools.

Assessment of Progress. There is positive progress toward the goal, although it is probable that the goal has not been met. While access is necessary for effective use of technology, providing students with access to computers and using computers to support instruction requires significant investments in hardware, software, wiring, and professional development, school districts vary greatly in their capacity to fund these improvements. Internet access is a good measure of access to educational technology because it requires not only an Internet connection but also access to a computer or other electronic device. Research has documented differences in access between high and low-poverty schools but also shows that access in all schools is increasing. In 1994, two percent of classrooms in high-poverty schools and four percent of classrooms in low-poverty schools had access to the Internet (see Figure 1.7.c.1). By 1999, the percentage of classrooms with Internet access had increased to 39 percent in high-poverty schools and 74 percent in low-poverty schools. The Federal role in reducing these disparities is significant. In 1997-98, Federal funds paid for 53 percent of computers purchased for high-poverty schools and 12 percent of computers purchased for low-poverty schools (USED, *Study of Educational Resources and Federal Funding*, 1999). There are no 2000 data available.

Figure 1.7.c.1



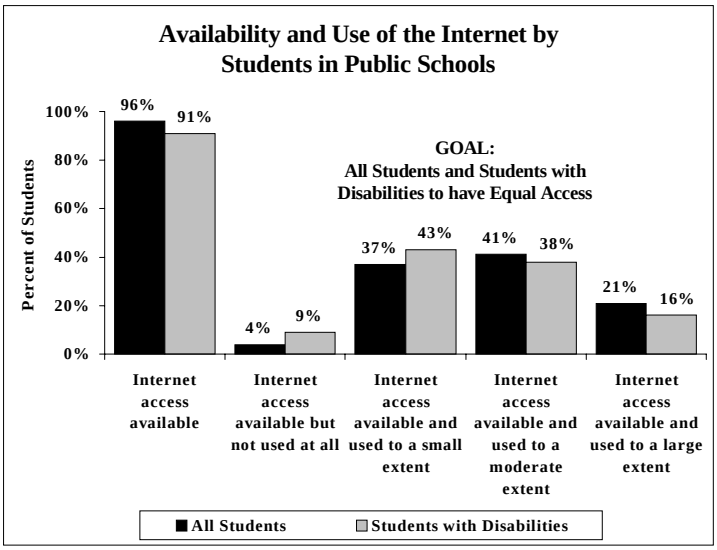
Source: NCES, Internet Access in Public Schools and Classrooms, February 1998; Internet Access in U.S. Public Schools and Classrooms, February 2000. *Frequency:* Annual. *Next Update:* spring 2001 for fall 2000 data. **Validation procedure:** Data validated by NCES's review procedures and *NCES Statistical Standards.* **Limitations of data and planned improvements:** Poverty measures are based on free and reduced-price school lunch data, which may underestimate school poverty levels, particularly for older students and immigrant students. *Planned improvements:* None.

Indicator 1.7.d. Students with disabilities will have access to educational technology that is, at a minimum, comparable to the access of other students.

Assessment of Progress. The Education Department is unable to judge progress as current data are only a baseline measure. The 2000 goal was not met. Internet access is a good measure of access to educational technology because it requires not only an Internet connection but also access to a computer. With the exception of moderate use, the availability of access to and extent of use of the Internet by students with disabilities is significantly less than for all students, though the magnitude of the difference is only a few percentage points. The National Institute on Disability and Rehabilitation Research (NIDRR) initiative will help provide technical assistance to schools so they know how to make

technology accessible to individuals with disabilities. Advances in technology and universal design are making significant contributions to overcoming barriers to access for the disabled.

Figure 1.7.d.1

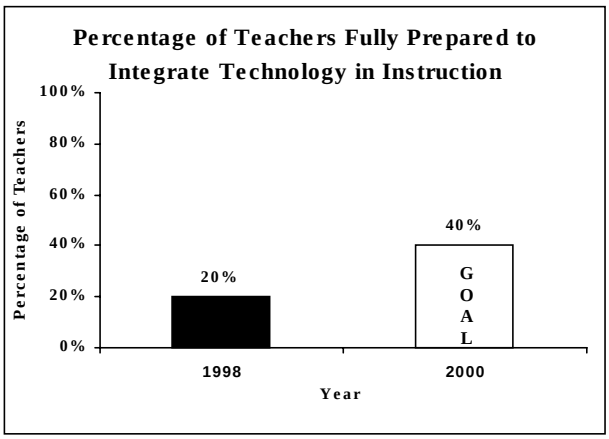


Source: NCES, Internet Access in U.S. Public Schools and Classrooms, February 2000, unpublished tabulations. *Frequency:* Annual. *Next Update:* spring 2001 for fall 2000 data. **Validation procedure:** Data validated by NCES's review procedures and *NCES Statistical Standards.* **Limitations of data and planned improvements:** The measure looks at access to the Internet and extent of use but does not look at quality of use.

Indicator 1.7.e. By 2001, at least 50 percent of teachers will indicate that they feel very well prepared to integrate educational technology into instruction.

Assessment of Progress. Progress toward the goal is likely although there were no 1999 National Assessment of Educational Progress (NAEP) data collected. In 1998, 20 percent of teachers reported that they were fully prepared to integrate technology in their instruction. Computers, effective software, online learning resources, and the Internet hold promise to improve learning; increase the amount of time students spend learning; and engage students in problem solving, research, and data analysis. Teachers' integration of the use of technology into the curricula is a major determinant of technology's contribution to student learning, once access to computers is provided. Federal resources for training of teachers to use technology (including the Technology Literacy Challenge Fund, the Technology Innovation Challenge Grants, and Preparing Tomorrow's Teachers to Use Technology programs) as well as state and local funds continue to support professional development in the use of educational technology for teachers and, correspondingly, progress toward the goal for this indicator. The data for 2000 are not available.

Figure 1.7.e.1



Source: NCES, *Teacher Quality: A Report on the Preparation and Qualifications of Public School Teachers*, January 1999. *Frequency:* Biennial. *Next Update:* spring 2001 for fall 2000 data. **Validation procedure:** Data validated by NCES's review procedures and *NCES Statistical Standards*. **Limitations of data and planned improvements:** The data are self-reported on feelings of preparedness rather than objective measures of teachers' actual classroom practice. The resources required, in terms of cost and burden, to regularly gather data other than self-report data on teacher preparedness for a Nationally representative sample are prohibitive. *Planned improvements:* None.

Indicator 1.7.f. Students will increasingly have access to educational technology in core academic subjects.

Assessment of Progress. Progress toward the goal is likely although no 1999 National Assessment of Educational Progress (NAEP) data were collected. The benefits of computers in schools and classrooms can be multifaceted, ranging from increased student motivation to improved teacher skills and student achievement. Of key importance is the extent to which computers in classrooms serve as learning tools that improve student achievement and whether students acquire the technology literacy skills needed for the 21st century. According to NAEP, the use of computers in instruction has increased substantially in recent years. In 1978, 14 percent of 13-year-olds and 12 percent of 17-year-olds used computers when learning math. By 1996, these percentages increased to 54 percent and 42 percent respectively (Figure 1.7.f.1). The data for 2000 are not available.

Figure 1.7.f.1

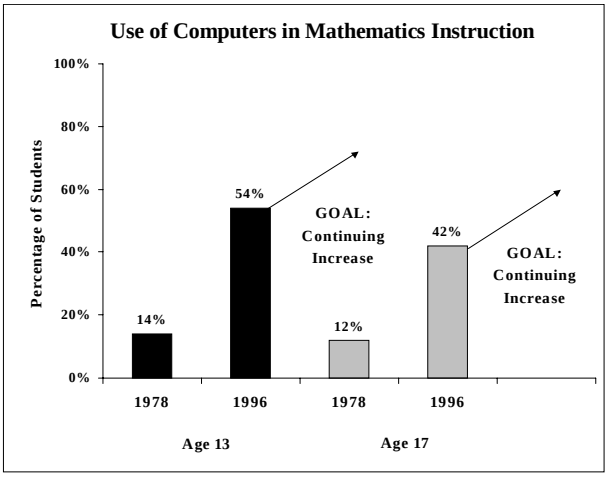
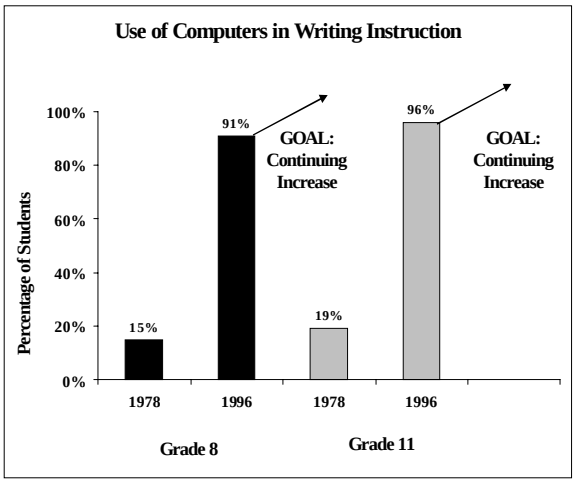


Figure 1.7.f.2



Source: National Assessment of Educational Progress (NAEP), 1978 and 1996. *Frequency:* Every four years per subject. *Next Update:* 2001 for 2000 data. **Validation procedure:** Data validated by NCES review procedures and *NCES Statistical Standards*. **Limitations of data and planned improvements:** Questions yielding this data do not fully capture the extent to which computers are regularly used in classrooms to support instruction. For mathematics, NAEP asks students if they have ever studied math through computer instruction. For writing, NAEP asks students if they use a computer to write stories or papers. *Planned improvements:* None.