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Since the early 1990s, the gap in the availability of computers and Internet access
between schools in affluent and poor areas has decreased dramatically. While most
schools now have computer and Internet access, many teachers still have difficulty with
incorporating this new technology into instruction. This is particularly true in poorer
urban school districts, where funding and time for teacher technology training are often
lacking.

This digest reviews the current state of teacher preparation for using educational
technology to improve student performance and achievement. It also describes some
promising initiatives for improving teacher technology training.

TECHNOLOGY SKILLS OF INSERVICE TEACHERS

Most teachers have some familiarity with computers and are able to use a variety of
computer software. Further, 94 percent of all respondents to a recent National
Education Association (2000) survey, and 99 percent of the respondents under 35, are
able to search the Internet.

Many teachers do not know how to incorporate computer skills into classroom
instruction, however, according to a National Center for Education Statistics report (U.S.
Department of Education, 2000a). Almost two-thirds of all teachers reported feeling not
at all prepared or only somewhat prepared to use technology in their teaching, but
younger teachers, who grew up with computers and were educated with them, indicated
they felt better prepared to use technology than their more experienced colleagues. Not
surprisingly, teachers who reported feeling better prepared to use technology were
more likely to make use of it than those who indicated they felt less prepared.

THE USE OF TECHNOLOGY IN LOW-INCOME SCHOOLS

Educational technology, when used to develop higher-order thinking skills, can have a
positive impact on learning, according to a study by the Educational Testing Service
(Wenglinsky, 1998). But teachers in low-income schools often teach about the computer
itself, and use computers for drill and practice, rather than for research, inquiry, and
communication, as is often the practice in wealthier schools. This strategy is based on
the assumption that children who lack basic skills need to learn them through drill before
they can move on to higher-order thinking activities. Unfortunately, these children often
do not get the opportunity to progress to higher-order problem solving. Furthermore,
research has shown that in real-life situations lower-order and higher-order thinking are
not separated; therefore, effective teaching should combine the two (President's

Committee, 1997).

TECHNOLOGY TRAINING IN TEACHER EDUCATION PROGRAMS

Current Practice. A recent study by the Milken Exchange on Education Technology (1999) and the International Society for Technology in Education found that, "in general, teacher-training programs do not provide future teachers with the kinds of experiences necessary to prepare them to use technology effectively in their classrooms." It emphasized that since the United States will need a projected 2.2 million new teachers over the next decade, "the time to examine and re-engineer our teacher preparation programs is now."
The study also pointed out several other deficiencies prevalent in teacher education programs (Milken Exchange, 1999):

* Approximately one-third of teacher education programs are limited by their information technology facilities.

* Most teacher training program faculty do not model the use of technology in teaching.

* Most teacher training programs do not have a written, funded, regularly updated technology plan.

* Most student teachers do not routinely use technology in their field experience and do not work with teachers who can advise them on its use, although information technology is available in the K-12 classrooms where student teachers get their field experience.

Recommendations for Improvement

The most important recommendation of the Milken Exchange study is to integrate technology training into the entire teacher education program, since instructional time spent in other classes, such as methods and curriculum courses, is much more useful for educating student teachers about computer use than are formal stand-alone technology courses. The study also recommends that the following strategies be incorporated into teacher training programs (1999):

* Focus institutional technology planning on the integration of technology in teaching and learning, not only on facilities.

* Provide student teachers with more opportunities to apply technology during field experience.

* Give school of education faculty the tools, incentives, and professional development

they need to integrate technology into the teacher training curriculum.

The Web-Based Education Commission, established by Congress in 1997, recommends making professional development in technology a high priority (U.S. Department of Education, 2000b). It cites several initiatives by Congress, the states, universities, professional organizations, and the business community which support intensive technology training for teachers:

* The Higher Education Act Amendments, passed by Congress and signed into law in 1998, hold institutions of higher education accountable for preparing teachers who are highly qualified not only in academic content areas but also in the effective use of technology in the classroom.

* The majority of states--42--now require that teachers demonstrate proficiency in technology as one component for receiving certification.

* The National Council for Accreditation of Teacher Education (NCATE), working with the International Society for Technology in Education, is incorporating technology standards into its accreditation process for teacher education colleges. While this effort is promising, NCATE is responsible for accrediting only 38 percent of the 1,300 teacher preparation programs in the United States.

* The CEO Forum developed a special StaR (School Technology and Readiness) self-assessment tool for schools and colleges of education. Over 240 institutions have undergone self-assessments to bring their programs from "low tech," with little or no technology use, to "target tech," the model for innovative use of educational technology.

CONTINUING EDUCATION FOR INSERVICE TEACHERS

Only four states require technology training for recertification of teachers, so much remains to be done in this area (Trotter, 1999). The CEO Forum on Education and Technology (1999) recommends the following:
* Every state should develop standards for effective continuing education on integrating technology into the curriculum.

* Schools and districts should develop technology plans that include professional development in the use of technology and proficiency standards.

* Every teacher and administrator should have access to information technology.

* Resources for technology-related professional development should be increased.

* Every professional development program should integrate technology into its

curriculum.

The Federal Office of Technology Assessment (1995) recommended that school districts devote at least 30 percent of their technology budgets to teacher training and support. However, only 6 percent of the $4.2 billion that K-12 schools spent on technology in 1996 went towards training (U.S. Dept. Of Education, 2000b). That figure increased to 17 percent for public school teacher technology training for the 1999-2000 school year, but it is still far below the recommended amount (Market Data Retrieval, 1999).

GOVERNMENT SUPPORT FOR TEACHER TECHNOLOGY TRAINING

A Presidential Panel report recommended that teachers need in-depth, sustained assistance to integrate computer use into the curriculum and reconcile new methods of instruction which use technology extensively with traditional methods (President's Committee, 1997). One program offering such training is the Teacher Led Technology Challenge (TLTC) in Berkeley, California, funded by the U.S. Department of Education's Technology Innovation Challenge Grant Program; it provides teachers with extensive support, tools, and professional development. A Classroom Technology Integration Specialist in each school plans and consults with teachers regularly during times set aside for this purpose. The TLTC was designed for adaptation by other school systems serving predominantly low-income and racially diverse populations (U.S. Dept. Of Education, 2000b).
The U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT3) Program, begun in 1999, offers grants to support teacher preparation improvements--mostly in low-income communities, rural areas, and among minority groups and special populations. In its first two fiscal years the program has made a total of $300 million available to teacher preparation institutions. The funds will help them develop programs that prepare prospective teachers to use technology for improved instructional practices and student learning opportunities. By 2004, over one million teachers will have received technology training as a result of these grants (see http://pt3.org/).

The Federal government is also facilitating technology learning through support of online learning environments, since the Internet can help isolated teachers make new connections and expand access to new resources. Specifically, the Internet can provide collaborative learning environments where teachers reflect on their practice, share expertise, and build a common understanding of new instructional approaches, by engaging with colleagues and experts in the field. An example is the Maryland Electronic Learning Community, also funded by the Technology Innovation Challenge Grant Program, which uses email, videoconferencing, digitized video, and Internet resources to support curriculum and professional development (Riel & Fulton, 2001; see

http://www.learn.umd.edu/ for a description). Two among many online sites where teachers and students can engage in collaborative learning and reflection are TAPPED IN (www.tappedin.sri.com) and the International Education and Resource Network (www.iearn.org).

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