The Computer-Related Teacher Certification Problem


Computers are at the heart of what could prove to be the greatest challenge our teacher credentialing system has ever faced. The challenge is one of potential major changes in both the content and process of education. Our teacher credentialing system for inservice teachers is based upon very slow or no change during a teacher's career. Our preservice credentialing system is designed to prepare teachers for jobs in a contemporary school system, much like the system the preservice teachers attended. But 10 years from now many schools may be drastically different from today's contemporary school.

Ten years from now there will be many communities in which computer hardware is so readily available, both in school and at home, that its presence will be taken for granted. Students will learn to read, write, do mathematics, retrieve and process information, communicate, and acquire a basic education in an environment that uses computers whenever they can be an effective aid to the overall learning process. All students will:

1. Develop substantial skills in using word processors, data base systems, graphics packages, computerized communication and information retrieval systems, and other general-purpose applications software. These skills will be used on a daily, routine basis in all subject areas as appropriate.

2. Make substantial daily use of computer assisted learning systems, including drill, tutorial, simulation, problem solving, and intelligent computer assisted instruction systems. These CAL systems will include an effective computer-managed instruction component to aid both the teacher and the student.

3. Learn curriculum content (in each discipline studied) that assumes computers are readily available as an aid to problem solving. Moreover, there will be increased emphasis on interdisciplinary studies and problem solving that cuts across several disciplines.

Twenty years from now the school district that has not incorporated such changes will likely be considered terribly out of date. Students who have not experienced such an education will probably be considered poorly educated, with an education not suited to their needs or the needs of our society. The credentialing problem is to ensure adequately prepared teachers for this instructional environment.

Notice that I have not mentioned the teaching of "computer literacy," computer programming, or computer science. The need to have a computer literacy course will have come and gone before the end of the next decade. (Meanwhile, the argument continues as to whether there is or ever was such a need, and more students are being required to take such a course.) Certainly, students educated in the environment discussed above will acquire a high level of computer literacy.
The teaching of serious courses in computer programming and computer science is (and will likely remain) the province of secondary school and higher-level educational systems. Our teacher credentialing system knows how to handle credentialing to teach specific secondary school courses.

For example, consider the credentialing of people to teach an Advanced Placement computer science course in high school. The Elementary and Secondary Schools Subcommittee of the Association for Computing Machinery has recently published carefully considered recommendations for the preparation of such teachers. The main controversy in this area will now be how to handle the "grandparent" issue—that is, how to handle credentialing of people who are already teaching such a course and do not have formal college credits that meet whatever guidelines a credentialing agency might establish. While this is not an easy credentialing problem, it seems small in comparison to the larger problem of non-computer teachers being addressed here.

To better understand the problem for non-computer teachers, consider the scenario of a sixth grade teacher in a self-contained classroom perhaps 10 years from now. Students entering the sixth grade are adept at composing at a word processor keyboard and are skilled in process-oriented writing. They make use of a spelling and grammar checker; they retrieve information and communicate via a computer. Their mathematics instruction from the first grade on has assumed the use of calculators and computers as an aid to problem solving. Their social studies curriculum has included the creation and use of data bases as a routine activity, as well as accessing computerized information retrieval systems. The students have had years of experience using graphics software and have learned to use math-oriented graphics software. The students have had substantial experience using sophisticated science-oriented computer simulations to explore a variety of science topics.

We could continue the scenario, but the problem should now be evident. The teacher must deal with a learning environment that is quite different from today's contemporary sixth grade classroom. And, the teacher's own precollege and college educational program did not foresee such changes.

Indeed, such a learning environment does not yet exist even in the best of school systems. Moreover, such a learning environment cannot spring into existence overnight. If students entering the sixth grade are to have had five years of previous experience in a computer-rich educational environment, we have time to help the sixth grade teacher get ready.

Continuing the sixth grade teacher example, suppose a school district is implementing the start of such an educational plan next year. To do so, it must deal with the specifics of the first grade curriculum and the preparation of first grade teachers. But at the same time it must address the issue of the sixth grade students and their teachers. Might the curriculum be modified so that the sixth graders learn both their conventional curriculum and the essential core of the computer-oriented and computer-based aspects of the first grade curriculum? The goal is to start both the sixth grade students and the sixth grade teachers on a path of learning to use computers in the curriculum. In the second year, sixth grade students would make additional use of computers in a manner consistent with their previous year's experience, and their teachers would gain additional computer education expertise.

Aha! An interesting idea. While the first grade students are experiencing the new computer-oriented and computer-based curriculum, all students and all teachers at higher grade levels...
could be experiencing the essential elements of this curriculum. Presumably, students at higher grade levels would learn only the most fundamental aspects of this new curriculum, and it would be carefully integrated with what they already have learned through their previous curriculum. The initial disruption to the curriculum in the higher grades would be minimal.

Let's carry this a little further. The first grade curriculum cannot be transformed overnight, since the software, curriculum, curriculum support materials, and appropriately trained teachers do not exist. Perhaps one might have a five-year plan for transforming the first grade learning environment and curriculum, with roughly one-fifth of the total change occurring each year. In the sixth year the second grade teacher would have a class full of students who had experienced the entire new first grade curriculum, and would be expected to provide these students with an appropriate (new) second grade curriculum. In the seventh year the third grade teachers would be expected to provide their students with a program of study building upon the computer-rich first two years of study the students have experienced.

This approach suggests the need for a five-year plan at the first grade level, a six-year plan at the second grade level, etc. There would be a 10-year plan for the sixth grade teacher and sixth grade curriculum. Secondary school teachers would have even longer to prepare for students whose entire elementary school program fully integrated computer technology.

The teacher credentialing problem is now evident. Many states issue a lifetime teaching credential. Others automatically renew the credential for teachers who continue to teach. None have provisions for requiring a sixth grade teacher to enter into a 10-year plan of study and practice to prepare for the job environment we are envisioning. Moreover, no teacher training institution is currently preparing teachers who would be comfortable in such a classroom environment.

A number of state educational agencies and/or state legislatures have seen fit to address the computer literacy issue for students. This has resulted in the requirement of computer literacy courses for many students. But no state educational agency, legislature or teacher's union has begun to address adequately the credentialing problem for the ordinary inservice or preservice teacher. If our educational system is to cope adequately with computer-related technology, the teacher training problem must be resolved. The problem need not and cannot be solved overnight or in a single year. Lifelong education must become a more important part of all teacher credentialing systems.

Retrospective Comment 8/4/05

This editorial was written 20 years ago. It contains forecasts for 10 years and 20 years in the future. These forecasts have proven to be quite inaccurate.

I wonder how I could have been so incorrect. The issue is not that the forecasts depended on continued progress in hardware and software. However, schools have not invested in the hardware and software to the extent that I forecast. Moreover, our preservice and inservice teacher education program has not risen to the challenge. A great many of today's teachers have a very low level of ICT knowledge and skills. They are not adequately prepared to integrate ICT into their everyday curriculum.

In 1985, I did not forecast that eventually ICCE (which became ISTE in 1989) would publish National Educational Technology Standards for Students in 1999. The ISTE NETS for students have been widely adopted. They are based on the idea of all teachers being able to work with
computer-using students. Indeed, the ISTE NETS for teachers, a more recent document, specifies that all teachers should meet the 12 grade ISTE NETS for students.

Thus, one might expect that eventually my 1985 forecasts will prove accurate, albeit perhaps 20 years too optimistic on the timeline!