

In recent years, we have seen technology move from a supplemental role to becoming a vital tool for improving productivity and quality in education. In the same time that technology for instruction has been advancing, the problems in education have multiplied.

Of the many problems plaguing education, none is more urgent than low productivity. Costs keep rising without corresponding growth in educational outcomes. Consequently, productivity in education is far below that of any other major industry. Studies show that labor costs in education are 83% of output, compared with 54% for the average U.S. business, and that education's poor productivity is directly linked to a lack of investment in computer-based technology.

■ Addressable Problems

At the same time, over 20 years of research shows that computer-based instruction produces at least 30% more learning in 40% less time at 30% less cost—and that is only a long-term average, not state-of-the-art. Recent advances in technology have significantly increased its cost effectiveness in education. In spite of this, one of the few consistencies within education—be it in primary, secondary or collegiate institutions—is the failure to capture the power of technology to improve learning, lower its cost and increase its accessibility to everyone.

Another serious problem is the lack of a broad consensus on how to get the necessary improvement in education. Unfortunately, actions for improvement that have been taken are often fractionated, isolated and duplicative. Consequently, even worthwhile changes have had only limited benefit and the wheel is being reinvented in hundreds of places. As a former grade school principal said recently, "Schools are too different."

What is needed is collaboration involving a large number of schools to first gain a consensus on what is to be done and then to work together to apply technology to realize significant reductions in cost, plus increases in productivity and accessibility of learning with continuous improvement in quality. However, these benefits cannot be obtained with technology as an add-on to the present system. Instead, it must be an integral part of a transforming system, where the role of the teacher changes from lecturer to learning facilitator, and the student's own responsibility for learning is increased.

■ Personalized Learning Plans

Also essential is a personalized learning plan for each student, based upon identified curriculum objectives and customized to each student's level of knowledge and learning styles. Through the use of personalized education plan management software, teachers assemble course curricula and monitor student progress.

At the same time, students can access their individual course status, as well as their current assignments and responsibilities. Personalized instruction allows students to spend more time on new or difficult areas, less time on those they have already mastered and, in other ways, assume more responsibility for their learning.

Personalized learning plans have a hand-in-glove relationship with the maximum appropriate use of computer-based, multimedia courseware. Access to a diverse array of courseware is essential for responding to individual learning modes and to reinforce the self-paced learning attendant to personalized learning plans.

■ Media Convergence Is a Good Omen

Boding well for the availability of low-cost, powerful, multimedia courseware in many subjects in the relatively near future is the convergence of computers, television, digital media and communications that is underway. This is manifested in several ways. One is that in a few years, an all-purpose home computer-to terminal for accessing movies, video games and education will be available to the mainstream public.

A second are the enormous investments now being made, and even larger ones planned, by the private sector to develop interactive multimedia and for building the networks to deliver multimedia directly into the home. While the initial thrust of this multimedia development is entertainment, the basic technology is highly applicable to education. Consequently, with the urgent need in both education and business for lower-cost, highest-quality, easily accessible learning, we are moving into an era where there will be both a demand pull and a supply push to apply that technology to all areas of education.

■ Planning Remains the Key

Yet one of the most formidable barriers to the adoption of technology is a lack of strategic planning by schools that fully embraces the utilization of technology. Many existing plans do not contemplate systemic change, but instead focus on incremental improvement to the present system, with little relationship to technology. During implementation of the plan, technology is brought in as an add-on to the existing system. This may result in some improved performance but at an increase in cost. To be effective, technology must be specifically connected with learning outcomes, curriculum and other aspects of the learning environment to maximize productivity, quality, accessibility and reduce cost.

Realizing the full potential of the increased use of technology will provide the type of education system that will enable all of our citizens to develop the skills that are essential for success in the next century.

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