

## Use of Technology

Kathleen Fulton on Evaluating the Effectiveness of Educational Technology

Do educational technologies work? This is the question asked by the press, parents, and education policymakers at all levels. While it's a simple question, and an extremely important one, answering it is far from simple. It's almost the equivalent of saying "Do textbooks work?" Yes, some textbooks "work," in some conditions, with some teachers, with some students, but these same textbooks may not "work" in another educational context. Clearly the question of technology effectiveness requires us to be clear in what results we seek, how we measure success, and how we define effectiveness.

Our past answers to the technology effectiveness question have been framed by our views of what education should be about, and the ways we have applied technology to meet those goals. For example, those working from a behaviorist model look to technology to help in building basic skills that can be tested on standardized achievement tests. Much of the drill and practice software promoted over the last decade has come with claims that it will bring improvements in student scores on these tests. And meta-analyses of computer-based instruction suggest that technology has been effective in helping students learn more, in less time, and with more enthusiasm.

But even this picture is not a simple cause and effect relationship. The technology doesn't teach the skills; rather, it has shown value in providing the opportunity for sustained practice (with rewards for success) that students need for developing fluency as skills become ingrained. But, it's fair to ask, isn't this an awfully expensive substitute for the flashcards and workbooks that worked for those of us who were schooled B.C. (Before Computers)?

The recent ETS study, *Does it Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics* reported in ED Week's *Technology Counts '98* frames the issue of "what works" in a new light. This study confirms what many of us have been saying for a long time, it's not how much you use computers that matters, but how. In correlating 4th and 8th grade students' scores on the 1996 NAEP (the National Assessment of Educational Progress) with data on classroom computer use, ETS's Walinsky suggests that some ways of using technology (i.e. simulations and applications or math/learning games) are more effective than others (i.e. drill and practice).

A more challenging issue revolves around the use of technologies for developing higher order skills of problem-solving, and the ability to access, organize, display, and communicate information. Ironically, while these are tasks computers were designed to improve in the "real world," they are the components least likely to be measured on standardized tests in school! Today, however, many school reform efforts are promoting a different set of goals than skill development.

If our vision is one that seeks to promote higher level thinking, problem solving, and better communication skills for all students, it may be more appropriate to ask if technology is effective in meeting these goals. Some of the more interesting questions we might explore include:

- \* Is technology helping students generate, test, and explore hypotheses and conjectures?
- \* Does it make it possible to make abstract concepts more understandable?
- \* Does it allow students to gain understanding of concepts and principles through exploratory interactions with representations such as diagrams and dynamic displays?
- \* Does it require students to use complex tools in ways appropriate to the field?
- \* Does it encourage students to solve unstructured problems, communicate about complex processes, and navigate and evaluate and use information effectively?
- \* Does it encourage them to learn independently as well as work collaboratively?
- \* Does technology provide an entry point to content areas and inquiries that might otherwise be inaccessible until much later in an academic career?
- \* Does technology extend and enhance what students are able to produce?
- \* Does the use of technology enhance creativity, improve design skills and the ability to present information well and in multiple formats?
- \* What effect does technology use have on student motivation?
- \* Does it have an impact on teachers that will be long-term in terms of supporting new forms of teaching built around reform goals?

Unfortunately, there is little agreement on what measures should be used to evaluate these outcomes. As a result, it makes it even more difficult to come up with an easy answer to the hard question, "Is technology effective?"

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