TECHNOLOGY AND STUDENT LEARNING

In support of *This We Believe* characteristics:
- Students and teachers engaged in active learning
- Multiple learning and teaching approaches that respond to diversity

"Does it work?" and "Is it effective?" are legitimate questions about educational technology. When educators ask these questions, they are really asking if technology helps students learn. But technology is only a tool, and the question cannot just be "Does the presence of technology improve learning?" It is clear that when researchers try to evaluate the educational uses of technology, what they are really evaluating are the broader pedagogical practices being used. The question, then, becomes: What kinds of technology are being used, under what context, and in what ways that help promote student learning? (Fulton, 1998; Software and Information Industry Association, 2000; Wenglinsky, 1998).

> *People who recommend more computers for the schools are like doctors who prescribe more medicine. What medicine? How much medicine? For what reason? The same questions apply to computers. (Tapscott, 1998, p. 135)*

From this perspective, this research summary examines technology's effect on student learning.

Summary of Research

Not all the research paints a rosy picture of technology in schools. Some show no academic improvement; no pay off for costly investments (Mathews, 2000). Other authors believe technology takes funding away from other resources and programs that may be more beneficial to students (Healy, 1999; Oppenheimer, 1997); that technology sits idle and is underused (Cuban, 2001); and that an over-reliance on technology can rob from children opportunities to express creativity, build human relationships, and experience hands-on learning (Alliance for Childhood, 2000).

Others come to very different conclusions. After reviewing the available research, the National Association of School Boards of Education Study Group on e-Learning concluded "e-Learning will improve American education in valuable ways and should be universally implemented as soon as possible" (NASBE, 2001, p. 4). Schacter (1995) reflected on the analysis of more than 700 studies and concluded that students who had access to educational technology showed positive gains in academic achievement. According to Lemke and Coughlin

(1998), while further research studies are needed, emerging trends indicate that, under the right conditions, technology:
- Accelerates, enriches, and deepens basic skills.
- Motivates and engages students in learning.
- Helps relate academics to the practices of today's workforce.
- Increases economic viability of tomorrow's workers.
- Strengthens teaching.
- Contributes to change in schools.
- Connects schools to the world.

Why might there be such discrepancy between authors? Some of the studies that show no positive effect from the introduction of technology into schools indicate deeper problems with the implementation. Many schools for example, have technology sitting idle or allow students to use it infrequently. Other schools conduct almost no training for their teachers or fail to provide teachers with adequate technology-based curriculum materials. Under such circumstances, no one would expect there to be improvements in student learning.

Other studies with negative results indicate that the initiatives themselves focused on hardware and software, or teachers taught about the technology instead of using the technology to enhance learning experiences. Bracewell, Breuleux, Laferriere, Beniot, and Abdous (1998) asserted that the integration of educational technology into the classroom, in conjunction with supportive pedagogy, typically leads to increased student interest and motivation in learning, more student-centered classroom environments, and increased real-life or authentic learning opportunities. Davis (1997) agreed that technology integration led to student-centered classrooms, which increased student self-esteem.

Schacter (1995) concluded that technology initiatives have to focus on teaching and learning, not the technology, to be successful: "One of the enduring difficulties about technology and education is that a lot of people think about the technology first and the education later" (p. 11). Educators are starting to recognize it is more important to use technology for learning than it is to learn how to use the technology.

Becker examined data from the 1998 national survey of teachers, Teaching, Learning, and Computing (TLC), and concluded:

> [U]nder the right conditions—where teachers are personally comfortable and at least moderately skilled in using computers themselves, where the school's daily class schedule permits allocating time for students to use computers as part of class assignments, where enough equipment is available and convenient to permit computer activities to flow seamlessly alongside other learning tasks, and where teachers' personal philosophies support a student-centered, constructivist pedagogy that incorporates collaborative projects defined partly by student interest—computers are clearly becoming a valuable and well-functioning instructional tool. (Becker, 2000, ¶4)

Educational visionaries are often frustrated that technology has primarily been used only to automate traditional education. They see the various ways technology will be used to revolutionize education through 'learning by doing' and in the kinds of collaborative communities young people are creating with technology (Richardson, 2006; Tapscott, 1998). Further, "Computer based technology has been called an essential ingredient in restructuring because it can provide the diversity in instructional methods necessary to reach all school children," according to Polin (1991). Papert (1996) described the important role technology can play in learning (Cherniavsky & Soloway, 2002; Papert, 1989, 1996; Schank, 2001; Schank & Cleary, 1995).

> I am convinced that a large proportion (though certainly not all) of cases of learning difficulty are produced by imposing on children ways of learning that go against their personal styles. Over and over again I have seen children shake off their apparent disabilities when given the opportunity to learn in a way that comes naturally to them. What I see as the real contribution of digital media to education is a flexibility that could allow every individual to find personal paths to learning. (p. 16)

Summary

In summary, technology has the potential to improve teaching and learning, but it depends heavily on teachers' purposes in using the technology, under which contexts they use it, and in which ways it is used.

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National Association of School Boards of Education Study Group on e-Learning (NASBE). (2001). *Any time, any place, any path, any pace: Taking the lead on e-learning policy.* Retrieved June 3, 2006, from http://www.nasbe.org/Educational_Issues/Reports/e_learning.pdf

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ANNOTATED REFERENCES

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Cuban (1986, 2000) has argued that computers are largely incompatible with the requirements of teaching, and that, for the most part, teachers will continue to reject their use as instruments of student work during class. Using data from a nationally representative survey of fourth through twelfth grade teachers, this paper demonstrates that, although Cuban correctly characterizes frequent use of computers in academic subject classes as a teaching practice of a small and distinct minority, certain conditions make a big difference in the likelihood of a teacher having her students use computers frequently during class time. In particular, academic subject area teachers who have at least five computers present in their classroom, who have at least average levels of technical expertise in their use, and who are in the top quartile on a reliable and extensive measure of constructivist teaching philosophy are very likely to have students make regular use of computers during class. In addition, other factors such as an orientation toward depth rather than breadth in their teaching (perhaps caused by limited pressures to cover large amounts of content) and block scheduling structures that provide for long class periods are also associated with greater use of computers by students during class. Thus, despite their clear minority status as a primary resource in academic subject classroom teaching, computers are playing a major role in at least one major direction of current instructional reform efforts.

Lemke, C., & Coughlin, E. C. (1998). *Technology in American Schools: Seven Dimensions for Gauging Progress. A Policymaker's Guide.* The Milken Exchange on Educational Technology. Retrieved June 3, 2006, from http://www.mff.org/publications/publications.taf?page=158

This framework, The Seven Dimensions for Gauging Progress, is intended for policymakers, educators, and technology directors to use as a road map when attempting to raise the learning levels of students through technology. It describes the conditions that should be in place for technology to be used to its greatest educational advantage in any classroom.

This publication is unique in its focus on systems thinking and systemic change, acknowledging that the transformation process necessary for effective integration of technology into learning is complex, requiring new ways of thinking, teaching, and learning for all participants in the system. The Seven Dimensions also provides educators with ways to assess movement toward their goals for learning with technology through sets of questions and stages of progress.

ANNOTATED REFERENCES (continued)

National Association of School Boards of Education Study Group on e-Learning (NASBE). (2001). *Any time, any place, any path, any pace: Taking the lead on e-learning policy.* Retrieved June 3, 2006, from http://www.nasbe.org/Educational_Issues/Reports/e_learning.pdf

The primary goal of this report of the NASBE Study Group on e-Learning is to provide a sufficient context so that education policy leaders can ask the right policy questions and take the lead on developing sound e-learning policies. The slogan adopted by the Florida Virtual School succinctly describes a compelling vision for a transformed education system, one in which "any time, any place, any path, any pace" learning is delivered through modern technologies that are available today. Having examined the emerging evidence and having considered the doubts and cautions, the NASBE Study Group on e-Learning concluded that e-learning will improve American education in valuable ways and should be universally implemented as soon as possible. Technology is not a solution in isolation, but rather a key component that helps make it possible for schools to address core educational challenges.

RECOMMENDED RESOURCES

Muir, M. (2006). *Technology to improve learning: Strategies for middle level leaders.* Westerville, OH: National Middle School Association.

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AUTHOR

Mike Muir is associate professor of middle and secondary education at The University of Maine at Farmington and director of the Maine Center for Meaningful Engaged Learning. He is currently a member of NMSA's Research Advisory Board and serves on the Design Team for Curriculum and Professional Development of the Maine Learning Technology Initiative.

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