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Research Brief

Learning with Technology

Question: What does research say about the use of instructional technology and improved learning?

Summary of Findings:

“Does it work? Is it effective?” are legitimate questions about educational technology. When educators ask these questions, they are really asking does technology help students learn.

There is clear evidence that technology can positively impact learning. For example, the National Technology Plan states, “The latest research and evaluation studies demonstrate that school improvement programs that employ technology for teaching and learning yield positive results for students and teachers.” And 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) reflects on the analysis of more than 700 studies and concludes 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 work force.
- Increases economic viability of tomorrow's workers.
- Strengthens teaching.
- Contributes to change in schools
- Connects schools to the world.

And the research on learning within a 1:1 learning with laptop environment is equally as promising. The Metiri Group (2006a, 2006b) in two recent reports, “1 to 1 Learning: A Review and Analysis,” and “Technology in Schools: What the Research Says,” points to the strong evidence that technology improves learning and higher order thinking skills. Further, the evidence from 1:1 learning with laptop initiatives (Metiri Group, 2006a) is that they not only improve student achievement, but advance digital equity, enhance teaching and learning, and strengthen economic development.

But technology is only a tool and the question cannot 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 really is “What kinds of technology are being used, under what context, and in what ways that help promote student learning?”

Wenglinsky suggests that, as technology advocates have asserted, technology does matter to academic achievement, with the important caveat that whether it matters depends upon how it is used. 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).

Schacter (1995) concludes that technology initiatives have to focus on teaching and learning, not the technology, in order 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



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learn how to use the technology. Bracewell, Breuleux, Laferriere, Beniot, & Abdous (1998) assert 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.

There are really two ways to use technology for teaching and learning. November (1990) refers to them as "automation" and "infomation." Christensen (1997) refers to them as "sustaining" and "disruptive."

The sustaining approach to educational computing uses computers to mimic the same behaviors and procedures that teachers do without the technology. That would include using technology to create worksheets and keep track of grades, to create PowerPoint presentations instead of using the blackboard or overheads, to post coursework and content online, to practice skills or learn new information through educational software, or to have online discussions.

Much of our early educational software, for example, was really direct textbook automation - we called it computer-assisted instruction. Later on came computer literacy, the computer-as-a-tool movement, and distance learning - which also repeated the basic practice of schools. Teachers still instruct in the same manner as before the technological innovation, delivering a content-based curriculum. (November, 1990)

Automation, ease of access, ease of modification, and looking good: these are real advantages of sustaining computing. The real gains which come from new technologies, however, are not from sustaining applications, but from disruptive applications. Disruptive applications represent innovation in teaching and learning. Within education, disruptive applications make available new and better ways of teaching. Disruptive uses of educational technology involve empowering students to do work they could not do before (or do as easily). Innovation often involves looking beyond how teachers can use technology for their teaching, to how students can use technology for their learning. There is often a focus on the process of learning content, not just how to make content available to students. Disruptive uses of technology include social networking, personal broadcasting, project-based learning with multimedia, data collection and analysis, digital storytelling, and WebQuests.

Technology has the potential to improve teaching and learning, but it depends heavily on the teachers' purposes in using the technology, under which contexts they use it, and in which ways it is used (sustaining or disruptive).

Online Resources:

Technology Integration

Edutopia

When effectively integrated into curriculum, technology tools can extend learning in powerful ways. The Internet and multimedia can provide students and teachers with access to up-to-date, primary source material; ways to collaborate with students, teachers, and experts around the world; opportunities for expressing understanding via images, sound, and text. Includes numerous links to articles, resources, exemplars, and professional development modules.

<http://www.edutopia.org/php/keyword.php?id=137>

A Bibliography of Research and Resources on Technology and Engaged Learning

<http://www.ncrel.org/sdrs/areas/techbib.htm>

National Educational Technology Goals

Given the tremendous progress made in integrating technology into teaching and learning and the continued advances in the affordability and capabilities of technology, the need to move beyond the 1996 goals became evident. In the fall of 1999, the U.S. Department of Education undertook a strategic review and revision of the national educational technology plan, in consultation with the full range of stakeholders. The outcome of this strategic review was five new national goals for technology in education.

<http://www.ed.gov/about/offices/list/os/technology/reports/e-learning.html>



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Any Time, Any Place, Any Path, Any Pace: Taking the Lead on e-Learning Policy

National Association of State Boards of Education's Report on e-Learning

Technology is not a cure-all, but a profound learning tool that if used in conjunction with other strategies can address core educational challenges. Our work is a clarion call to policymakers to set thoughtful and coherent policy on issues surrounding e-learning and technology in schools and I am very pleased that it offers concrete state examples on a range of topics, including online assessments and online courses for credit

http://www.nasbe.org/Educational_Issues/Reports/e_learning.pdf

The Impact of Education Technology on Student Achievement: What the Most Current Research Has to Say

John Schacter, Ph.D

Each year, legislators, governors, and other policymakers make difficult choices among attractive educational improvement options. Whether to invest in class-size reduction, teacher training, early childhood education, textbooks, or tests depends on their estimates of the effectiveness of these approaches. This briefing outlines what current research has discovered regarding the impact of educational technology on learning, and identifies resources for further study. While most of this research is in its infancy, we are beginning to see solid work emerge.

<http://www.mff.org/publications/publications.taf?page=161>

Technology in American Schools: Seven Dimensions for Gauging Progress

Cheryl Lemke & Edward Coughlin

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 bring up 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.

<http://www.mff.org/publications/publications.taf?page=158>

Technology In Schools – What The Research Says

Metiri Group

Three decades after the first computer was introduced into school classrooms, educational technology remains surprisingly controversial. This paper provides a forum for informed use of technology in the context of emergent research from the learning sciences.

<http://www.cisco.com/web/strategy/docs/education/TechnologyinSchoolsReport.pdf>

1 to 1 Learning: A Review and Analysis

Metiri Group

Innovative educators are embracing a bold new catalyst to learning: 1 to 1 computing. The "laptop for every student" concept is changing how, when, and where students learn. The potential of 1 to 1 learning is maximized in schools where these technology tools are deployed in classrooms characterized by academic rigor, real-world experiences, and high-quality teaching that incorporates research on how people best learn.

http://images.apple.com/education/k12/onetoone/pdf/1_to_1_white_paper.pdf

Does It Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics

Harold Wenglinsky

This report presents findings from a national study of the relationship between different uses of educational technology and various educational outcomes. The author found that higher mathematics scores were related to adequate access to computer technology (hardware, software, and overall infrastructure) in conjunction with teachers trained in technology use and the use of computers to learn new, higher-order concepts. The author also points out that it is precisely in the areas of teacher training and type of computer use that inequity across SES, race and geographic locale are most pronounced.

<ftp://ftp.ets.org/pub/res/technolog.pdf>

Findings from the Teaching, Learning, and Computing Survey: Is Larry Cuban Right?

Henry Jay Becker



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Cuban 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 4th through 12th 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. 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.

<http://epaa.asu.edu/epaa/v8n51/>

The Emerging Contribution Of Online Resources And Tools To Classroom Learning And Teaching

Bracewell, R., Breuleux, A., Laferrriere, T., Beniot, J., & Abdous, M.

The goal of this documentary review is twofold: 1) to update the first review, entitled The Contribution of New Technologies to Learning and Teaching in Elementary and Secondary Schools, prepared for SchoolNet and published on TACT Website in the summer of 1996; and 2) to identify the research gaps on the impact and effective uses of online tools and resources in the classroom.

<http://www.tact.fse.ulaval.ca/ang/html/review98.html>

Critical Issue: Using Technology to Improve Student Achievement

How can schools ensure that the promise that technology holds for student achievement is realized? What factors need to be in place to support the effective use of technology? What resources can school districts use to help them plan for technology that will have a positive impact on student achievement, and how can they justify that investment? In this updated briefing (originally published in 1999), we examine current research perspectives and findings on using technology to improve student achievement.

<http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te800.htm>

Moving Beyond Automation

Alan November

While futurists tell us that 80 percent of the jobs our kindergarten students will hold as adults do not yet exist, that future generation will undoubtedly recognize the job of teacher when they look for work. Yet, teachers still instruct in the same manner as before the technological innovation, delivering a content-based curriculum. Students figure out what the teacher knows or, sometimes, what the computer has stored in its memory.

<http://www.anovember.com/default.aspx?tabid=159&type=art&site=28&parentid=20>

The Innovator's Dilemma

Clayton M. Christensen

Christensen describes two types of technologies: sustaining technologies and disruptive technologies. Sustaining technologies are technologies that improve product performance. Disruptive technologies are "innovations that result in worse product performance, at least in the near term." Disruptive technologies occur less frequently, but when they do, they can cause the failure of highly successful companies who are only prepared for sustaining technologies.

<http://web.mit.edu/6.933/www/Fall2000/teradyne/clay.html>

Submitted Date: 2/5/2007 By: Mike Muir, Maine Center for Meaningful Engaged Learning

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