



background

Report # 116

Technology In Education

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iPhone, X-Box, Internet & Learning

Exploring popular technology's potential to educate

Children today grow up in a society awash in advanced technologies that offer them highly sophisticated, tantalizing entertainment and communication options, including games with incredibly realistic simulations and phones that allow them to instantly connect with one another and the world. And with just a few clicks of the mouse, they can create own presence on the Internet.

But in terms of learning, the implications of growing up in this extremely hi-tech world are far from being fully understood. Computer-based technologies are simply developing at a pace that scientists and educators cannot keep up with.

And that is not likely to change anytime soon.

"With more computer power, we are able to do things that weren't possible 10 years ago or even 5 years ago," said Alan Lesgold, Ph.D., dean of the University of Pittsburgh School of Education. "What the technological changes in the future will largely mean is that things that we understand how to do but always seemed too big for us will no longer seem too big.

"Today, you can author videos illustrating culturally complex situations where the videos are entirely animations. We knew how to do it at the \$50 million or \$100 million level for DreamWorks some time ago, but it is now becoming doable at an affordable level. That is one of the big changes."

Historical trends suggest the cell phones, computers, software and video games of today will be rendered crude predecessors of more advanced technologies in a few short years.

In recent years, the computer industry has been able to roughly double the amount of computer power available to consumers about every 18 months.

Education is changing in the face of technology, albeit slowly, according to a 2009 special report in the journal *Science*.

The report provides a glimpse of what is being learned about how education is changing in the face of technology, including implications for science and math education, and the impact widespread exposure to technologies outside the classroom has on the skills children develop.

What is clear is that every medium has its strengths and weaknesses and new technologies are no exception.

The challenge for researchers and educators is to find ways to capture the potential for learning that technology offers, while taking into account the weaknesses and limitations of

In the classroom, educators are exploring ways of using technology to enhance the teaching of science and math. They are also trying to understand the impact exposure to video games and other technologies outside the classroom has on the skills children develop.

these media.

High Tech Tutors

One area of exploration is using advanced computing as a high tech tutor. Cognitive Tutor is demonstrating that potential.

This software program developed by Carnegie Mellon University scientists is used to help teach algebra to students in 2,600 U.S. middle schools and high schools. Unlike many other instructional software products, Cognitive Tutor is based on academic research, including the principles of sound cognitively-based instruction.

Another strength is its ability to measure a student's skills and offer instruction tailored to that assessment at different stages in the problem-solving process.

Students are given a series of problems that become progressively more difficult. Cognitive Tutor's develop-

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ers say its fundamental instructional tool provides students with relevant hints for solving the problem that are tailored to the degree of difficulty each is facing. Those who often ask for a hint are offered several examples of a similar problem to build mastery of the skill.

The algebra tutor was effective in helping students learn algebra and in raising their scores on standardized tests in a small, randomized study.

But as with many new technologies, definitive evidence of effectiveness awaits further investigation. A large-scale study of Cognitive Tutor is now underway.

Beyond The Classroom

Another important area of study today is how exposure to television, computer-based games, the Internet and other technologies at home and in other out-of-school environments is producing learners with a new profile of cognitive skills, including more sophisticated visual-spatial skills.

Research suggests these media enhance an understanding of pictures and icons as well as build spatial orientation, spatial visualization and other visual literacy skills that are important in the world of computers and used in many of today's professions.

As with all media, such benefits come at a cost. Video games may be effective at developing visual literacy skills, for example, but they do a poor job promoting abstract vocabulary, inductive problem solving, critical thinking, imagination, reflection and other key skills.

And game content is not benign. A significant body of research has found that exposure to violence depicted in video games, television and other visual media, tends to encourage ag-

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gressive behavior and desensitization to violence and decrease pro-social behavior.

An example of the benefit-cost trade off associated with technology can be seen in the ability of students to perform multiple tasks at the same time, or multitasking.

Research suggests that video games, for example, promote skill in multitasking. But studies that look at how well information is processed through multitasking suggest there is a cost.

In one study, a group of students watched CNN news broadcasts that included anchors reporting the news with "news crawls" – written weather, sports and other news – streamed across the bottom of the screen. A second group watched a broadcast without the news crawls.

The result: Students who viewed the more visually complex format with the news crawls remembered significantly fewer facts from news stories than students who watched the visually simple version of the broadcast.

Such findings have implications for schools and educators.

"As kids get more experience in everyday life doing 10 things at once, we need to learn both how much attention they need to be paying for a given instruction approach to work and what might shape their ability to attend to that level," Dr. Lesgold said.

It is one of the challenges technology poses for education. Others include understanding the strengths and weakness of rapidly developing technologies, and finding a mix of new media and older media, such as print, that adapts to a more technology literate generation of learners while promoting development of a balanced set of skills.

For Dr. Lesgold, the relentless march of technology raises an even larger question. "When I think about the nature of human existence, I keep thinking about what can we teach people that will give them a happy, productive and survivable role in a world where machines can do more and more of the stuff that used to be valued human capability."

references

This article was largely based on the following publication:
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