

Slide 1

Making Sure Technology  
Pays Off

Harvey Barnett  
Senior Research Associate,  
WestEd




Hello. Imagine this moment in your life as a school administrator. A skeptical school board member, prospective parent, or local public official visits your school and, after a tour in which you point out the wonderful new computers, scanners, digital cameras, and other technology which you've acquired over the past few years, says to you, "You've clearly made a tremendous investment in technology. How do you know this investment will pay off in terms of student learning? I'm Harvey Barnett, and in this presentation, I'll share information that can help you answer that question.

Slide 2

Agenda

- Summary of key findings
- Identify conditions where technology can make a difference
- Implications for planning




During the next few minutes, we'll do 3 things: First, we'll review some of the most significant research on technology use in the classroom; second, we'll look at the conditions under which technology is most likely to have a positive impact on student learning, and third, we'll consider the implications for school technology planning.

Slide 3

Two Approaches  
to Computers at School

- Learning **from** computers
  - Using computers as tutors
- Learning **with** computers
  - Using computers as tools in the learning process




Educational researchers have studied two major ways in which children use computers in schools. The first is learning **from** computers. Here the computer acts as tutor. The computer presents information to the student and the student responds. Simple drill and practice programs and more comprehensive Integrated Learning Systems, such as Jostens and Computer Curriculum Corporation, are examples of this category. Researchers' second focus has been on how students learn **with** computers. Students use computers and other technologies as you do as an adult: to write, to analyze data, to develop presentations, and to do research. Here the computer is one of many tools, albeit a critical one, that students use during the normal course of their school day. So, what does this research tell us?

Slide 4

What West Virginia did

- Elementary school; one grade added each year
- Extensive teacher training
- Classrooms or lab
- Software based on content standards




First, let's look at two longitudinal studies on how students learn **from** computers. The first is the West Virginia Basic Skills study. West Virginia began implementing technology in one grade at a time, starting with first grade. Each year the state added a grade until reaching Grade 6. In addition, each year there was extensive teacher training. Schools had the option of placing computers in classrooms or in a lab. Schools were also required to select from suites of software that matched West Virginia's content standards. Researchers followed students from first grade to sixth grade, and beyond. Here's what they found.

Slide 5

What West Virginia found

- Consistently higher gains on statewide tests
- Technology = 11% of gain
- Classroom use superior to lab
- Advantages lasted through high school




On statewide tests, students using computers showed consistently higher gains. The researchers were able to determine that 11% of the gain was due to the use of technology.

Researchers also found that students did better when the computers were in the classroom rather than a lab. Finally, the advantages of computer use extended through high school, where computer-using students had better grades, took more advanced placement courses, and were more likely to graduate.

Slide 6

What Florida did

- Computers placed in classrooms
- Extensive teacher training
- Software aligned with content standards




A second important study is Project CHILD from Florida. Project CHILD placed computers in classrooms and, like the West Virginia project, provided extensive teacher training and had students use software that was aligned with the state's content standards.

Slide 7

What Florida found

- Higher test scores in both high and low achieving schools
- Better discipline
- Gains sustained over time




The Project CHILD researchers found that computers contributed to higher scores for students in both low and high achieving schools. Students had better discipline. And, just as was the case in the study of computer use in West Virginia, the boost technology gave students was sustained over time.

Slide 8

Learning **from** Computers

- Technology yields an advantage.
- The advantage is long lasting.  
...When...
- Teachers receive on-going training.
- Computers are in the classroom.




The studies in West Virginia and Florida show that students can gain an advantage when technology is deployed to bolster and complement the traditional work of teachers, and that the effects of computer use are lasting. These results are obtained where there is on-going teacher training and where computers are available for use in the classroom.

Slide 9

Learning **with** Computers

- Technology as a tool
- Learning with vs. learning from




But what does research say about the effects of technology when it's used as a tool rather than a tutor. How is learning **with** computers different from learning **from** computers? In fact, this application of technology is even more powerful, as the following two studies demonstrate.

Slide 10

What ACOT did

- Infused classrooms with technology
- Available anytime
- Intensive teacher training
- Time for teachers to reflect, discuss




In a study sponsored by Apple Computer that spanned ten years, researchers, who were from institutions of higher education and not Apple employees, analyzed Apple's Classrooms of Tomorrow project, known to many by the acronym ACOT. In ACOT classrooms, technology was pervasive and available anytime a student needed it. Teachers received intensive training and were given time to examine their beliefs about instruction and learning. Researchers arrived at four critical conclusions.

Slide 11

What ACOT found

- Routine use of higher order skills
- Enhanced collaborative skills
- Increased initiative
- Change in teacher beliefs



First, students routinely used higher order thinking skills far beyond what was expected for their grade level.

Second, students demonstrated enhanced ability to collaborate with peers to develop projects and reports.


Third, students demonstrated increased initiative. They maintained time on task for longer periods and often continued their work during recess, before and after school.

Fourth, the use of technology coupled with teachers having time for reflection led, over a period of three to five years, to substantial changes in teacher beliefs about teaching and learning.

Slide 12

What the Multimedia Project did

- Teachers worked in teams
- Multiple forms of support
- Students learned by planning, designing, and producing curriculum-based multimedia presentations.



These ACOT findings are reinforced by a recent study of the Challenge 2000 Multimedia Project conducted by SRI International. In the Multimedia Project, teams of K-12 teachers were trained to develop curriculum-based multimedia projects with students. The teachers received intensive on site support.

Slide 13

Authentic Assessment task

- Students worked in small groups
- Studied plight of homeless students
- Formulated recommendations
- Designed brochure for advocacy



In the final evaluation of the 5-year long project, the researchers asked students in project and non-project classrooms to complete an authentic assessment task. All students were given a set of resources and data about homeless students and the problems such students face in attending school. In small groups, students had to study the information, formulate a set of recommendations for their school leaders on how their own school might better serve the needs of homeless students, and create a prototype of a brochure for advocating their position. The brochures were evaluated using a rubric especially developed by SRI to help measure the impact of the use of technology.

Slide 14

What SRI researchers found

- Better understanding of content
- Better able to craft a message for a particular audience
- Better design skills




What did SRI's researchers find? Students in Multimedia Project classrooms consistently outscored their peers in the non-project classrooms in the areas of content understanding, adapting their message to their intended audience, and applying principles of design in the format and layout of their brochures.

Slide 15

Learning *with* Computers

- Increased critical thinking
- Increased initiative & collaboration
- Superior content, communication, and design skills
- Positive changes in teacher beliefs





Together, the ACOT and Multimedia Project studies point out how powerful technology can be when it is employed as a tool for research, data analysis, and communication. Does that mean we abandon the use of computers for simply acquiring specific facts and rudimentary skills? Of course not.

Slide 16

Balance

Learning from: *instruction*      Learning with: *construction*

We have to remember that it's never a question of either learning with computers or learning from them, but a balance between instruction and construction based on the objectives of the lesson.

Slide 17

Implications for Planning -

1. Access	5. Professional development
2. Integration	6. Teaching style reform
3. Broad-based reform	7. Balance
4. Long-term effort	8. Vision



This is all very nice, you say, but so what. What does it mean to you as school administrator who is planning for the use of technology in your school?

Here are eight important implications for technology planning:

**Access:** Computers will not enhance learning if students do not have easy access to them. Using computers once or twice a week will have negligible impact on student learning.

**Integration:** Computers make their greatest impact on student learning when their use is tightly linked to

your content standards and integrated into on-going classroom work, rather than taught as a separate or stand-alone subject.

Broad based reform: Computers and all technologies are just one tool in a broad based reform effort to improve student learning. Just as computer use needs to be integrated within the on-going instructional program, technology planning needs to occur within the context of the school or district strategic planning process.

The long term: Like any other reform effort, computer use is not a one time event. It's not simply a matter of "buy them, install them and sit back to enjoy the difference they make." It will require a long term effort on your part to fund, support and assess their use.

Professional development: Having a swimming pool does you little good if no one can swim, and learning to swim well is not done in a couple after school workshops. Especially to empower teachers and students to learn *with* computers, you will need to plan for ongoing staff development that takes place in large groups, one-on-one, and online.

Teaching style: For technology to have the impact research says it can, many teachers will have to learn more than new technology skills; they will need learn new instructional strategies and new roles. You'll need to ensure they have the opportunity and support to transform their approach to teaching.

Balance: Like any reform effort, you don't throw out the baby with the bath water. There is always a


balance. Yes, teachers need to teach facts; they also need to help ensure students acquire and use the intellectual and workplace skills demanded by the 21<sup>st</sup> Century.

Vision: As the research on effective principals demonstrates again and again, leadership is the single most important factor affecting the successful integration of technology in education. Principals and superintendents must have a vision of how technology will support student learning and teacher productivity.

Slide 18

Next steps...

- Share with colleagues.
- Explore the resources here on Portical.
- Return for additional presentations.



I hope you've found this brief overview about how research can support your technology implementation helpful, and that you'll want to share the information with others. The Portical resource matrix includes links to the four studies summarized in this presentation as well as to many more similar resources you will find useful. Finally, return often to Portical. In the upcoming months, you'll find a growing collection of presentations like this on a variety of topics to assist you in your technology leadership role. For now, this is Harvey Barnett saying, "Good bye until next time."

Citations:

- ❑ [Apple Classrooms of Tomorrow \(ACOT\)](#)
- ❑ [Challenge 2000 Multimedia Project](#)
- ❑ [Project CHILD](#)
- ❑ [West Virginia Study](#)